

DEPARTMENT OF AGRICULTURE.

TANGANYIKA TERRITORY.



REPORT

For the Fifteen Months ending March 31st, 1924.

PRICE 2s. 6d.

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REPORT

For the Fifteen Months ending 31st March, 1924.

ESTABLISHMENT AND GENERAL ORGANISATION.

1. The staff during the period under review was as follows :—

| | | | | |
|---------------------------------|-----|-------------------|-----|----------------------------|
| Director | ... | A. H. Kirby | ... | Dar es Salaam. |
| Deputy Director | ... | H. Wolfe | ... | " |
| Entomologist | ... | A. H. Ritchie | ... | Morogoro. |
| Senior Agricultural Officer. | | D. Prain | ... | Bagamoyo and Rufiji. |
| District Agricultural Officers. | | E. Brand | ... | Rufiji. |
| | | R. J. Lathbury | ... | Moshi. |
| | | A. Pitcairn | ... | Shinyanga (Tabora). |
| | | O. E. Whitehead | ... | Lindi. |
| | | A. E. Haarer | ... | Morogoro. |
| | | L. C. Edwards... | ... | Mwanza. |
| Plant Import Inspector. | | A. R. Hildebrand | ... | Tanga and Morogoro. |
| Head Gardener, Dar es Salaam. | | T. H. Marshall... | ... | Dar es Salaam. |
| Chief Clerk | ... | W. E. Pownall... | ... | " |
| Clerk | ... | A. L. B. Bennett | ... | " |
| Overseer, Experiment Station. | | A. Lombard | ... | Shinyanga (from November). |

Biological and Agricultural Institute, Amani :—

| | | | |
|---------------|-----|---|--------|
| Director | ... | A. Leechman, M.A. (Oxon.), F.L.S., F.C.S., F.E.S. | Amani. |
| Head Gardener | ... | F. M. Rogers | " |

2. Asiatic Staff consisted of :—

| | | | |
|-----------------------|-----|------------------|----------------|
| 1st Grade Clerk | ... | J. P. Santa Rita | Dar es Salaam. |
| 2nd " " | ... | J. B. D'Souza | " |
| 4th " " | ... | N. A. D. Gilbert | " |
| Assistant Gardener... | | V. Jansz | Amani. |
| Laboratory Assistant | | Raden Soleman | " |

3. The African Staff consisted of :—

| | | | |
|-------|-----|------------------------|------------------------------|
| Clerk | ... | Frank Mfuni | Dar es Salaam. |
| " | ... | Alfred Mohando | " |
| " | ... | Mahomed b. Abdullah... | " |
| " | ... | Mdachi b. Scharifu | Amani (until November 10th). |
| " | ... | Bury Thomas | Amani. |

4. The following posts have been abolished :—

Plant Import Inspector.
 Assistant Director, Amani Institute.
 Laboratory Assistant, Amani Institute.
 Library Clerk, Amani Institute.

5. Officers were absent from station on duty as follows :—

| | No. of Nights. |
|---|-------------------|
| Director | 34 |
| Deputy Director | 52 |
| Entomologist | 69 |
| Senior Agricultural Officer, Bagamoyo and Utete ... | 191 |
| District Agricultural Officer, Utete | 125 |
| " " " Moshi | 100 |
| " " " Shinyanga | 141 |
| " " " Lindi | 171 |
| " " " Morogoro | 8 |
| " " " Mwanza | 181 |

6. The following officers were absent on leave :—

HEAD OFFICE STAFF.

A. H. Kirby, Director—February 16th, 1924, to March 31st, 1924.
 H. Wolfe, Deputy Director—January 1st, 1923, to July 8th, 1923.
 T. H. Marshall, Head Gardener—April 28th, 1923, to October 18th, 1923.
 W. E. Pownall, Chief Clerk—July 13th, 1923, to March 3rd, 1924.
 A. L. B. Bennett, Clerk—March 4th, 1924, to March 31st, 1924.
 J. P. Santa Rita, Clerk—January 1st, 1923, to April 3rd, 1923.
 J. B. D'Souza, Clerk—May 9th, 1923, to November 13th, 1923.

AMANI INSTITUTE STAFF.

A. Leechman, Director—December 23rd, 1923, to March 31st, 1924.
 F. M. Rogers, Head Gardener—January 1st, 1923, to April 9th, 1923.
 Raden Soleman, Laboratory Assistant—November 14th, 1923, to March 31st, 1924 (on abolition of post).

DISTRICT AGRICULTURAL OFFICERS.

E. Brand, Rufiji—November 15th, 1923, to March 31st, 1924.
 R. J. Lathbury, Moshi—April 14th, 1923, to October 2nd, 1923.
 A. Pitcairn, Shinyanga—March 29th, 1923, to September 7th, 1923.
 O. E. Whitehead, Lindi—December 19th, 1923, to March 31st, 1924.
 A. E. Haarer, Morogoro—May 31st, 1923, to January 3rd, 1924.
 L. C. Edwards, Mwanza—December 23rd, 1923, to March 31st, 1924.

ENTOMOLOGIST.

A. H. Ritchie, Morogoro—December 19th, 1923, to March 31st, 1924.

PLANT IMPORT INSPECTOR.

A. R. Hildebrand—November 27th, 1923, to February 18th, 1924 (on abolition of post).

7. Native agricultural instructors were employed in the various districts as follows :—

| District. | Maximum. | Minimum. |
|----------------------|----------|----------|
| Bagamoyo | 7 | 5 |
| Bukoba | 1 | 0 |
| Dar es Salaam | 5 | 2 |
| Dodoma | 1 | 0 |
| Kilwa | 5 | 1 |

| District. | Maximum. | Minimum. |
|---------------------------------------|----------|----------|
| Lindi (including Mikindani) | 16 | 2 |
| Usambara | 3 | 0 |
| Mahenge | 1 | 1 |
| Morogoro (including Kilosa) | 16 | 4 |
| Moshi | 5 | 4 |
| Mwanza | 19 | 9 |
| Pangani | 2 | 1 |
| Tabora (including Kahama) | 7 | 0 |
| Tabora, Shinyanga sub-district | 8 | 1 |
| Rufiji (including Mohoro) | 5 | 3 |
| Totals | 101 | 33 |

8. With the small staff and the large districts to be covered, the agricultural services continue to be performed extensively rather than intensively. An officer is in charge of the agricultural work in each of the more important districts and possesses a subordinate staff of native instructors stationed in defined areas of the district. Certain districts of large or moderate production, particularly Bukoba and Kilwa, continue to be without the services of an Agricultural Officer, but as additional staff is now sanctioned, these wants will shortly be supplied.

9. Owing to the absence on leave of the Deputy Director during the first half of the year and subsequently the increasing attention required in connection with the Tanganyika Court of the British Empire Exhibition (the Director having been appointed Chairman of the Tanganyika Committee), the Director was able to undertake very few visits for district inspection during the period under review.

10. The Deputy Director disembarked at Mombasa on his return from leave and proceeded on a tour in the districts of Mwanza, Tabora (mainly the important sub-district of Shinyanga) and Morogoro.

11. The Entomologist has had under his purview chiefly the cotton and coffee pests of the Territory. In addition to the general advisory and investigational work of his office at Morogoro, he conducted a special field investigation of the coffee industry in the Moshi and Usambara Districts.

12. The attention of the Department continues to be mainly devoted to cotton, which has shown a gratifying increase in production.* Special attention has been given to the development of the native coffee industry in the Moshi District and to the introduction of ploughing among the cattle-owning natives in the Shinyanga sub-district of Tabora. For the rest, the activities of the Department have been concerned with the general agriculture of the Territory, including experimental work at its stations.

AGRICULTURAL INSTRUCTION AND EDUCATION.

13. Ordinary agricultural instruction among native growers was increased during the period under review by the addition of native instructors to the district staffs and by the more numerous opportunities that were presented of assemblages of natives at cotton markets and at distributions of seed. Owing, also, to a larger provision for travelling expenses, officers were able to spend more time touring their districts. Results of this instruction were seen particularly in better sorting of the cotton which was brought into the Government markets, where the product is sold in three separate qualities. In this respect, cotton grown by natives is superior to that grown by non-natives. The task of agricultural improvement is rendered less difficult in the case of natives by the habit of obedience, by a long-established custom of clean cultivation due to experiences of insufficient production of food-crops in unfavourable seasons, and by the supplies of improved planting material now

* See table on p. 16.

at the disposal of the Government. The instruction is directed towards the food crop as well as the export crop, for it is recognised that a permanent increase in yields of the former will release labour and land for devotion to the latter.

14. The apprenticeship scheme for native instructors at the Morogoro station has been discontinued, and reliance is now placed upon the teaching of young intelligent natives by the District Agricultural Officers and their more experienced instructors. The time is not now distant when young educated natives will be leaving the Government Schools and seeking situations of this nature, when the apprenticeship scheme will be resumed under better conditions.

15. The agricultural instruction of pupils at the Government Schools remains meagre through lack of opportunity for sustaining instruction of this kind. The method to be depended upon for obtaining native agricultural instructors, mentioned in the last paragraph, will bear fruit in this direction as well, for the best of the pupils will return to the Education Department, equipped with agricultural knowledge for the teaching of others. This is, at present, the only discernible means of providing agricultural education in the schools. Meanwhile, this Department continues to provide assistance with inspection and advice, supplies of seed and the occasional lessons the Agricultural Officer of the district is able to give.

IMPROVEMENT AND EXTENSION OF CROP PRODUCTION.

16. The methods adopted are :—

(a) Personal advice, instruction, demonstration and propaganda by the district staff.

(b) Distribution of planting material.

(c) Experimentation and investigation.

(d) Advice by correspondence and in Press articles.

The general work of the district staffs has already been outlined. The distribution of seeds is summarised in Appendix I. Cotton naturally continues to occupy the leading place, and a marked increase in distribution and sowings by natives and non-natives is to be recorded. The following tabulated list of cotton-seed distributions to natives from 1921 to 1924 (inclusive—the crop is planted between January and March, thus falling within the period under review) indicates the progress which has taken place :—

COTTON SEED DISTRIBUTION TO NATIVES.

| District. | 1921. | 1922. | 1923. | 1924. |
|----------------------|----------------|------------------|------------------|-------|
| | Tons. | Tons. | Tons. | Tons. |
| Arusha | — | $\frac{1}{2}$ | $2\frac{3}{4}$ | 1 |
| Bagamoyo | 6 | 10 | 25 | 34 |
| Bukoba | 6 | $3\frac{1}{2}$ | 2 | 20 |
| Dar es Salaam | $\frac{1}{2}$ | $2\frac{1}{2}$ | 4 | 13 |
| Kilwa | 15 | 19 | 20 | 60 |
| Lindi | 30 | 37 | 113 | 160 |
| Lushoto | — | $1\frac{1}{2}$ | $\frac{3}{4}$ | 2 |
| Mahenge | — | $1\frac{1}{4}$ | 3 | 5 |
| Morogoro | 26 | 14 | 84 | 208 |
| Moshi | — | — | $3\frac{1}{4}$ | 8 |
| Mwanza | 30 | 130 | 140 | 338 |
| Pangani | $\frac{1}{4}$ | 1 | 3 | 8 |
| Rufiji | $4\frac{1}{2}$ | 60 | 70 | 120 |
| Tabora | $1\frac{1}{2}$ | 9 | 10 | 68 |
| Tanga | — | $\frac{1}{2}$ | $\frac{1}{2}$ | 2 |
| Dodoma | — | — | — | — |
| Kigoma | — | $1\frac{1}{2}$ | — | — |
| Kondoa Irangi | — | 5 | — | — |
| Tukuyu | $\frac{1}{4}$ | — | — | — |
| TOTAL | 120 | $296\frac{1}{4}$ | $481\frac{1}{4}$ | 1,047 |

The work of experiment and investigation is carried out on the Department's experiment stations and that for the period covered by this Report is recorded in the section beginning with paragraph 36. The work of the Cotton Specialist and his staff in cotton improvement is summarised in the same section. The advice by correspondence is conducted mainly at the head office, and the Press articles are published in the Government monthly paper for natives (Mambo Leo) and in the Dar es Salaam weekly English newspaper which circulates throughout the Territory. The articles include reports during the growing season on the crop conditions in the leading agricultural districts.

17. An important feature of the work of crop extension has been the introduction of ploughing among natives. Following a survey of the suitable areas, the sub-district of Shinyanga was chosen for the initiation of this work upon an experimental scale. The objects of the experiment were to test the adaptability of the native male to this departure from the long-established practice and custom of hand-cultivation, which has always been done by the women, and to lay the foundation for a large and rapid development, the other contributory factors being :—

(a) A closely settled population of natives, who are agriculturists and pastoralists both and have intelligence and an inborn sense of handling and caring for cattle.

(b) A docile type of cattle, which, though small, are of hardy constitution.

(c) Extensive cultivable areas of soil of excellent texture and fair fertility, situated in open country and therefore free from the tsetse fly.

These factors assured the success of the experiment beforehand and the introduction was timed to meet the increased interest of the natives in cotton production which was evinced during 1923. The tribal organisation of the natives, into villages under headmen responsible to sub-sultans, who are subordinate in turn to the ruling sultans, lent itself very readily to an organisation of cotton cultivation by communities. The communal cultivation was adopted, not as an end in itself, but as a means to a superior and larger individual cultivation which will naturally follow when knowledge and capital will both have been gained through the more effective nursing of the industry implied in the communal system. A station was established for the training of oxen, the instruction of natives in ploughing and in the training and driving of oxen, as well as for demonstration and the testing of different types of ploughs. Twenty-five ploughs were purchased and issued to native villages, which are to repay the cost from the proceeds of the communal crop (sold on markets conducted by the Department) over a period of two years. The Administrative Officer of the sub-district gave the most energetic assistance in propaganda and in directing the communal organisation for the ploughing. The result of the experiment has been the ploughing of five hundred acres of land (now under cotton) by natives without assistance (other than the previous training), and a request by the council of sultans for the supply of 320 additional ploughs for use in the next cotton season, on the same terms of repayment. The native cultivators themselves are enthusiastic and the training station is kept filled by men voluntarily coming forward for instruction. The station is being maintained and the district staff of native instructors is now also receiving training, the object being eventually to make a skilled ploughman of every cattle-owning native in the sub-district.

18. An interesting development of this work has been the beginning of the extension of ploughing into the areas at present covered by bush and infested by the tsetse fly. This has become necessary because of the advance of the bush into the open country, which has gradually reduced the grazing areas for the increasing herds of cattle until overstocking has become alarmingly acute and the danger of the closing of the outlets for cattle is threaten-

ing. The Departments of the Chief Veterinary Officer, the Game Warden, the local District Administration and of Agriculture are working in unison in the clearing of bush on the boundaries of the open country (voluntarily being done by the natives in the threatened sultanates) and of passages to the main routes of transport, to be followed by the settlement of natives and the introduction of ploughing. With these advanced settlements established, it is expected that ordinary development will bring about the further recession of the fly-infested bush. Thus areas will be released for the cotton crop, the cultivation of which in certain parts of the open country might otherwise have been sacrificed to the need of preserving the cattle.

19. *Coffee Cultivation by Natives in the Moshi District.*—The work of the extension of coffee cultivation among natives in the Moshi District has made a substantial advance. The following table and particulars are extracted from a report prepared by the Senior Commissioner, Moshi:—

| | 1916. | 1922. | March, 1924. |
|--------------------------------------|--------|---------|--------------|
| Number of Planters | — | 592 | 1,400 |
| Bearing trees | 37,153 | 36,265 | 68,714 |
| Immature trees | 51,194 | 52,429 | 104,800 |
| Trees planted during the year | — | 89,726 | 199,678 |
| Total number of trees | 88,347 | 178,420 | 373,192 |

The lack of progress between 1916 and 1922 is accounted for by the neglect of plantations and of fresh planting during the war. 250,000 trees are now available for planting in 1924, and it is already certain that the demand will be far greater than this. The provision and supervision of nurseries have suffered from the absence on leave of the District Agricultural Officer. An average number of trees in the native plantations is 500, and more than this is not encouraged as being beyond the capacity of the native family to care for. The native coffee growers have been formed into local associations with the objects of more ready instruction, the provision of central nurseries, the co-ordination of the needs of the industry and, possibly, co-operation.

20. The native potato-growing industry in the Uluguru hills, which had declined owing to deteriorated strains, was revived by the introduction of fresh stocks of seed-tubers from Kenya Colony, under a scheme of widening distribution which will have covered the whole area before the end of 1924.

21. Toward the end of the period under review a maize export industry of some promise was launched in the Moshi District, the maize being grown chiefly by natives. In the first three months of 1924, 1,023 tons were railed to the ports; in the calendar year 1923, 45 tons only were so railed. The chief causes of this rise have been the lowering of railway rates and the re-opening of the Voi—Taveta railway.

22. The rehabilitation of the ex-German coffee plantations has proceeded with greater rapidity, owing to a year of good coffee prices on the English market, and may be said to be almost complete. Fresh plantations were established and a large demand arose for seedlings ready for immediate planting, these, in some cases in the Moshi District, even being purchased

from native planters. A similar impetus of good prices has led to rehabilitation and fresh plantings on the ex-German sisal plantations and to the opening up of new areas.

23. *Improvement in the Quality of Cotton.*—In 1921, the Department, which had then just begun, inherited the deteriorated seed which was found in the country at the close of the war. In 1922 an introduction of fresh seed was made from Uganda and a further introduction was made for the 1923 sowings. The districts chosen were, in 1922, Mwanza (in the north-west), and in 1923 Morogoro (central) and Lindi (in the south), and the object was to spread the fresh strain of seed from these points until the whole Territory was covered. The old stocks of native-grown seed were eliminated from these districts, and the greatest care was taken to ensure the separate ginning of native and non-native cotton. In the 1924 sowing season (February-March) the only parts of the Territory which had not received the fresh seed were the district of Kilwa, the western portion of the Rufiji District and the small-producing districts on the Tanga railway. The native sowings in these have been less than one-tenth of the total native sowings in the Territory. As yet, the fresh seed has not been available for all non-native growers, it being possible only to supply all planters in the Lindi District and 120 tons to planters in the Morogoro and Dar es Salaam Districts, but the supplies from the 1924 crop will be more than sufficient to permit the total elimination of old seed. In respect of the introduction into Mwanza and Shinyanga, the report of the Imperial Institute on the eight samples of seed-cotton sent for examination states that these are superior to those sent in previous years (from the old seed). The strength is described as good in all cases except one, which is noted as fairly good. The average length of staple was 1·2 inches and the uniformity in length was superior to that of previous years. The Imperial Institute's report on the Morogoro and Lindi cottons is not yet available, but it is possible to give the brokers' reports (with which the Department has been favoured by local buyers) of consignments to Liverpool of first quality cotton grown by natives from seed of the Uganda importation sown in these two districts in 1923. These are as follows :—

| Source. | No. of Bales. | Report. |
|-----------------|---------------|--|
| Kilosa | 88 | White colour, very clean, staple $1\frac{1}{4}$ in. |
| Do. | 37 | Nice white cotton, strong, $1\frac{1}{4}$ in. staple. |
| Do. | 31 | Nice clean cotton, strong, $1\frac{3}{16}$ in., regular. |
| Do. | 23 | Choice creamy cotton, even running, excellent grade, though small amount of seed and stain, staple strong, $1\frac{3}{16}$ to $1\frac{5}{16}$ in., some $1\frac{1}{2}$ in. |
| Morogoro | 10 | Beautiful clean cotton, $1\frac{1}{4}$ in., strong staple. |
| Do. | 26 | Nice clean cotton, staple $1\frac{3}{8}$ to $1\frac{3}{16}$ in., slightly irregular. |
| Do. | 19 | Beautiful clean cotton, $1\frac{1}{4}$ in., strong staple. |
| Tuliani | 4 | Choice creamy cotton, even running, excellent grade, though small amount of seed and stain, staple strong, $1\frac{3}{16}$ to $1\frac{5}{16}$ in., some $1\frac{1}{2}$ in. |
| Lindi | 74 | Very nice lot, staple good, $1\frac{3}{16}$ in. |
| Do. | 100 | Choice creamy cotton, even running, excellent grade, containing a little leaf. Staple $1\frac{3}{16}$ in., strong. |

24. The special selection work of the Cotton Specialist at the Mpan-ganya Cotton Station in the Rufiji District reached a further stage in 1923 when, as a result of the examination of the progeny of the single plants chosen in 1922, thirteen selections, each representing the produce of a single plant, were sown. As a result, the purity of these unit strains was not definitely established, though the standard of purity of certain of them was found to be not inferior to that of American varieties received from the United States Department of Agriculture and sown in the same season for

purposes of comparison. The selections finally chosen for expert examination in England, with a view to growing some or all of them in 1924, and the data on which the choice of these was based, are as follows :—

| Strain. | | | Mean of variation of four variants. | Length of lint and coefficient of variation. | | Lint index and coefficient of variation. | |
|------------------------|-----|-----|-------------------------------------|--|--------|--|---------|
| | | | % | mm. | % | gm. | % |
| M | ... | ... | 5.28 | 27.3 | (2.90) | 4.30 | (8.08) |
| H | ... | ... | 6.00 | 26.1 | (4.22) | 4.44 | (6.02) |
| D | ... | ... | 6.30 | 27.9 | (3.76) | 4.20 | (10.10) |
| J | ... | ... | 8.06 | 27.6 | (4.56) | 4.04 | (13.00) |
| N | ... | ... | 8.80 | 29.5 | (6.20) | 3.72 | (13.60) |
| Mean of all selections | | | 8.2 | 26.3 | (5.81) | 4.07 | (11.10) |

During 1923, the Cotton Specialist selected a large number of plants at different points in the Morogoro District and the produce of these was collected separately. Selections from among these plants, after a careful examination of the produce, will be grown in 1924, and the process and basis of future selections will be the same as has been described for those at the Mpanganya Station. The Cotton Specialist has also assisted the Department in the examination of local samples and in the preparation of instructions to District Agricultural Officers for field selection of cotton types.

MARKETING IMPROVEMENT AND EXTENSION.

25. Owing to the circumstance of a number of District Agricultural Officers being on leave, it was not found possible to extend in 1923 the system of auction marketing which had been so successful in 1922. The regular auction markets were confined to the districts of Morogoro and Lindi, and were introduced experimentally at Nassa, in the Mwanza District. These were all highly successful in securing expeditious marketing and top values. They have proved to be eminently satisfying to the natives and largely account for the considerably increased sowings for the 1924 crop. In other districts, sales were either of the open character or were localised and supervised by the District Agricultural Officer, and in the district of Kilwa by the Administrative Officer. Wherever such supervision was possible, and especially at the auction markets, the important feature of grading according to the now well-known three qualities (based on cleanliness) was maintained. In the districts of Morogoro, Lindi, Rufiji and Bagamoyo this has been the chief means of assisting the instructional measures of the agricultural staff in successfully establishing among the natives the practice of sorting the seed-cotton, though this is still too largely done after picking. Buyers for the Liverpool market have expressed their pleasure at the progress made in this direction while still dissatisfied with the mixed condition of cotton grown by non-natives. A summary of the conditions and statistics of the different markets is given in the following paragraphs.

26. *Morogoro Cotton Markets.*—Auction markets were held at Morogoro and Kilosa, and native seed-cotton was bought at Ngere-Ngere by Messrs. Rosehaugh and Co. at their ginnery. The total figures were as follows :—

| Cen'tre. | | | 1st Quality. | 2nd Quality. | 3rd Quality. | Total. | Value Shs. |
|-------------|-----|-----|--------------|--------------|--------------|---------|------------|
| Morogoro | ... | ... | 171,814 | 83,704 | 93,629 | 349,147 | 217,752 |
| Kilosa | ... | ... | 171,485 | 101,310 | 127,493 | 400,288 | 226,455 |
| Ngere-Ngere | ... | ... | 14,290 | 14,530 | 1,987 | 30,807 | 14,068 |
| TOTALS | | | 357,589 | 199,544 | 223,109 | 780,242 | 458,275 |

The total figures for 1922 were as follows :—

| | |
|----------------|---------------|
| Weight in Kgs. | Value in Shs. |
| 149,494 | 63,423 |

There was thus an increase of over five times in quantity and seven times in value. The following table indicates the fluctuations in selling price at the auction markets (the minimum prices were those of the first auction at each centre; for the remaining three auctions the prices were considerably higher—the prices are stated in cents of a shilling per kilogram) :—

| Centre. | | | | 1st Quality. | | 2nd Quality. | | 3rd Quality. | |
|----------|-----|-----|-----|--------------|------|--------------|------|--------------|------|
| | | | | Max. | Min. | Max. | Min. | Max. | Min. |
| Morogoro | ... | ... | ... | 91 | 50 | 80 | 46 | 61 | 40 |
| Kilosa | ... | ... | ... | 92 | 44 | 82 | 33 | 64 | 25 |

27. *Lindi Cotton Markets.*—Auction markets were held at Lindi, Mingoyo and Mikindani. The total figures of the sales were as follows :—

| 1st Quality. | 2nd Quality. | 3rd Quality. | Total. | Value. |
|-----------------|----------------|----------------|-----------------|-----------------|
| Kgs. 100,232 | Kgs. 77,847 | Kgs. 59,343 | Kgs. 237,422 | Shs. 135,519 |

The fluctuations in prices were as follows (in cents of a shilling per kilo) :—

| 1st Quality. | | 2nd Quality. | | 3rd Quality. | |
|--------------|------|--------------|------|--------------|------|
| Max. | Min. | Max. | Min. | Max. | Min. |
| 81 | 68 | 71 | 60 | 58 | 37 |

28. *Experimental Auction in the Mwanza District.*—The object of this auction was to test the suitability of the system in the outlying areas of production in this district, which is the district of greatest production in the Territory. It is recognised that for the main producing areas, the system requires supervision and staff beyond the capacity of the Department to supply, and in these areas competition is sufficiently keen to assure by ordinary sale at specially appointed centres a large measure of the advantages possessed by the auction system. Nassa was selected as the locality for the experiment. Two auctions were held; the result was sufficiently successful to justify an extension and three further localities have been appointed for auction sales in the 1924 season. The following are the figures for the sales :—

| 1st Quality. | 2nd Quality. | Total. | Value. |
|---------------|---------------|----------------|------------------|
| Kgs. 5,200 | Kgs. 6,600 | Kgs. 11,800 | Shs. 5,974·81 |

29. *Rufiji Cotton Sales.*—The crop was purchased, in the absence of local buying competition, by the local ginneries on a sliding scale of guaranteed prices, based on the weekly Liverpool price. The deliveries were as follows :—

| | | | | | | | Value. |
|----------------|------------|-----|-----|-----|-----|---------|-----------|
| | | | | | | Kgs. | Shs. |
| Western Rufiji | { Kilimani | ... | ... | ... | ... | 199,039 | } 107,533 |
| | | ... | ... | ... | ... | 104,547 | |
| Eastern Rufiji | { Mohoro | ... | ... | ... | ... | 42,206 | } 16,174 |
| | | ... | ... | ... | ... | 4,035 | |
| | | | | | | 349,827 | 123,707 |

The figures for 1921 and 1922 were 324,162 kgs. and 371,275 kgs. respectively. The slight decrease in 1923 is accounted for by the shortage of rains during the growing season in the hill country and on the Mpan-ganya plateau, a failure more serious than that of 1922.

30. *Kilwa Cotton Sales.*—A purchasing agreement was entered into with the local ginnery, in the absence of local buying competition. The deliveries and value of the native crop were as follows :—

| 1st Quality. | 2nd Quality. | 3rd Quality. | Total. | Value. |
|-----------------|----------------|----------------|------------------|----------------|
| Kgs. 73,033½ | Kgs. 55,449 | Kgs. 40,712 | Kgs. 169,194½ | Shs. 59,620 |

31. *Bagamoyo Cotton Sales.*—A similar arrangement was made as for Kilwa with two ginneries, one at Bagamoyo for the eastern and central areas, and the other at Ngere-Ngere for the western area. The total sales were as follows :—

| 1st Quality. | 2nd Quality. | 3rd Quality. | Total. | Value. |
|----------------|----------------|---------------|----------------|----------------|
| Kgs. 58,948 | Kgs. 17,756 | Kgs. 8,417 | Kgs. 85,121 | Shs. 36,209 |

32. *Market for Shinyanga Cotton.*—In the absence of buying competition justifying the holding of auction markets in this new and promising cotton area, which is situated over 90 miles from Mwanza (the outlet for its produce), the cotton was sold under contract to the nearest ginnery in the Mwanza District owned by the British Cotton Growers' Association. The totals of sales were as follows :—

| 1st Quality. | 2nd Quality. | Total. | Value in |
|----------------|----------------|----------------|----------------|
| Kgs. 12,951 | Kgs. 34,788 | Kgs. 47,739 | Shs. 16,698 |

33. *Market for Moshi Cotton.*—46,215 kgs. of cotton were produced by natives in this district and were sold under contract to the local ginnery, realising Shs. 25,039.

34. Other areas of small production for which markets were found were Pangani, Mahenge, Usambara. There are no ginneries in these areas. A roller hand-gin was permitted to be used in the Mahenge District. Ginneries are in course of erection in the Pangani and Usambara areas and marketing will be thus facilitated and cheapened.

35. The Agricultural Department has no administrative connection with markets for produce other than cotton, but it is nevertheless interested in these from the standpoint of the cheapening and facilitating of marketing and securing for growers the highest market value, as leading towards increased production. To this end it seeks to introduce for export products, wherever feasible, the auction market system which has been so successful with cotton, and encourages the sale of these on grade or quality. A notable example of such introduction has been the copra and gum copal markets

at Bagamoyo, instituted in 1922 and now firmly established. The figures of the sales for the calendar years 1922 and 1923 were as follows :—

| COPRA. | | | | GUM COPAL. | | | |
|---------|-------|--------|---------|------------|-------|--------|--------|
| Weight. | | Value. | | Weight. | | Value. | |
| (Tons.) | | (Shs.) | | (Tons.) | | (Shs.) | |
| 1922. | 1923. | 1922. | 1923. | 1922. | 1923. | 1922. | 1923. |
| 176 | 955 | 56,306 | 323,201 | 12½ | 13½ | 11,400 | 20,068 |

This system of special auction sales is spreading to other districts. It is now a regular feature in the Dodoma District, in which it was independently instituted by the Administrative Officer for the sale of groundnuts (the chief crop of the district). The sales in 1923 amounted to £38,400, and in 1922, £19,200. In the Morogoro District it is applied to all export products, the chief of which (other than cotton) are rice and simsim (sesame). At Dar es Salaam natives have the option of disposing of their produce at the auction sales or at market stalls and the preference is overwhelmingly with the former.

WORK IN STATIONS, GARDENS AND PLOTS.

36. The experimental work at the two agricultural stations at Morogoro and Mpanganya (Rufiji) continues to be concerned mainly with cotton. At neither station has it yet been possible to extend the scope or the scale of the experiments, owing to one officer only being available at each for both the district and the station work. At Mpanganya, the Cotton Specialist kindly agreed to his Assistant taking over the experimental plots which adjoin his own selection plots. At Morogoro there have been changes of staff, owing to officers departing on leave, which has somewhat disturbed the work of the season.

MOROGORO AGRICULTURAL STATION.

37. *Cotton Variety Trials.*—The following varieties were sown (in 1/10th acre plots): Cambodia (from Madras), Bancroft and Early King (from the United States of America), Zululand Hybrid (from South Africa), Uganda Upland and Nyasaland Upland, with local seed as a check. Unfortunately, in the absence, owing to illness, of the District Agricultural Officer responsible for the previous year's experiments, the plots were not planted on the same day and for comparative purposes the results were therefore vitiated. Useful observations were, however, taken, of which the following are the chief to be noted. The American varieties (Bancroft and Early King) matured earliest and showed a marked uniformity of type. The latter yielded well. The Cambodia showed a mixture of types, but retains its hardness and resistance to insect pests; it will not be useful for propagation purposes for field sowing on account of the shortness of the staple (not exceeding 1 inch), but may prove valuable for hybridisation. The Uganda Upland yielded well, but appeared to show a rather greater susceptibility to insect attack than did the other varieties. The Zululand Hybrid and Nyasaland gave low yields. Except for Cambodia, these trials are being continued in the present season.

38. *Cotton: Time of Sowing Experiment.*—The plots (1/10th acre) were sown, as last year, at fortnightly intervals from the 6th February to the 17th April and received ordinary treatment. The best result was from the sowing on the 21st March, though that of the 20th February, the best plot in last year's experiment, approached it in yield. The plot sown on the

intervening date, however, 7th March, gave a very poor yield, even though it was 70 per cent. resown, after bad germination, before the 21st March. The results of these two years' experiments are tending to show a restriction of the favourable sowing season to a four or five weeks' period ending in the third week in March for conditions such as exist at the Station, which lies at the foot of the Uluguru Hills. Such conditions are found over a large area in which cotton is successfully grown, there being other hill formations in the district similar in type and altitude (at base) to this extensive one. For the cotton areas situated in the plains, the Department is initiating a co-operative set of time of sowing experiments among planters, and those at the Station are to be continued.

39. *Cotton: Distance of Sowing Experiment.*—All plots (1/10th acre) were sown on the 21st February. The distances were 3 feet between the rows in each case and 9, 15, 18 and 24 inches between the plants in the different plots. The yields respectively were 32, 29, 25½, and 23 lb. of seed-cotton. The same progressive decline is noted as in last year's experiment, except for the 9 inch plot, which gave the lowest yield in 1922. The experiment is being continued, and in future the cotton from the different plots will be examined for differences in quality and especially in strength of staple.

40. *Trials with Proso Millet.*—This low-growing and quickly-maturing millet was introduced with the purpose of ascertaining its suitability as a native food crop for growing in the short rainy season of November and December. The crop had failed on the station in 1921-22 and 1922-23. It was, however, successful in 1923-24. Five 1/10th acre plots were sown on the same date in rows varying from 1 foot to 2 feet apart. Germination took place on the 2nd December and the seed was harvested on the 8th February, yielding at the rate of 300 lb. per acre on the plots in which the rows were 1 foot and 1½ feet apart, after being heavily attacked by birds. The District Agricultural Officer states that the chief obstacle to the cultivation of this crop among natives will be that it ripens at a time when no other grain is available in the district for birds, which exist in large numbers.

41. *Trials with Tobacco.*—These have proved only that tobacco cannot be successfully grown and cured under the constantly humid conditions existing during and after the rains. The period of the experiment is consequently being altered to the dry season (July) and irrigation will be used. Sowings in experiments of previous years were made in the short rains (December) and at the opening of the heavy rains (March).

42. *Trials with Efwatakala Grass (Melinis minutiflora).*—One-half acre was put under this grass to test its suitability to local conditions and its value as an insect repellent. It made a dense growth and reached a height of 2 feet before flowering. Observations have not as yet confirmed its reputed value in respect of insect pests.

43. *Maize Trials.*—The trials with the imported maize varieties, Hickory King and Natal 8-row, were continued and have established the superiority of the latter, which will now be multiplied for controlled distribution among natives to replace the deteriorated seed now in use.

44. The further experiments begun in 1922 were suspended owing to lack of supervising staff.

45. *Orchards and Nurseries.*—A new banana grove has been planted and the old one cut down. The old pawpaw trees are in course of replacement. The citrus orchards yielded exceptionally well, but little demand was found for the purchase of the fruit. The dwarf variety of date palm bore fruit for the first time this year; it is intended to introduce this into native cultivation. The Carambola is very well suited to local conditions, and fruit is

obtained over the greater part of the year. Cuttings are now available from the osier (*Salix viminalis*) planted in 1922. The tung oil trees (*Aleurites Fordii*) continue to make good growth, but that of the wood oil tree (*A. montana*) has apparently ceased at a height of 2 feet. On the Station Nursery, a large variety of economic and ornamental plants have been grown for local planting and for distribution. (The full list of seeds available for distribution will be found in Appendix II.) Among these the ginger introduced from Jamaica has shown a greater vigour in its first year than even the best growths of the local strain. In addition to the Station Nursery, another has been laid down for part of the propagation work required for the Botanical Gardens, Dar es Salaam, where the soil is of too poor a texture and fertility and the water too brackish to permit of good nursery conditions. The Station distributed 96 packets of seeds, 300 lb. of maize seed and 237 plants and parcels of planting material.

MPANGANYA AGRICULTURAL STATION.

46. The cotton experiments on this station last year were taken over for continuation by the Cotton Specialist of the Empire Cotton Growing Corporation and his Assistant. The season was an unfortunate one in respect of drought and the plots failed either wholly or partially. The following extracts from the Cotton Specialist's report appear to bear out the opinion begun to be formed in 1922 that the situation and the soil of this Station, which, under the German rule, was the principal cotton station in the Territory, are not suited for the purpose of experiments designed to serve the major cotton growing area of the district:—

(a) For the season 1923, a fairly comprehensive scheme of experiments was arranged, in consultation with the Director of Agriculture. The prolonged drought emphasised unsuspected differences in the soil, and produced a most extraordinary patchiness, which affected the whole of the Station area. These differences have largely spoilt the experimental work at the Station this year; in a more normal year it is probable that they would show up much less, if at all.

(b) *American Varieties*.—Seed of five varieties (Trice, Lone Star, Acala, Durango and Columbia) was sown in Field No. 6, four plots to each variety, with a plot of ordinary station cotton corresponding to each. Figures for yield are valueless; the land showed the same extraordinary variation, though the site had been specially chosen, from the experience of the previous year, for uniformity. As in the selections, ten plants to each variety and of the local cotton were labelled, and the same observations made on them. Speaking generally, the American varieties have bigger seeds, bigger bolls and a higher lint index and a higher percentage of lint than the local strain. Their lint is shorter, and rather harsher to the feel, and some of them are quite obviously impure. In Durango, four of the plants possessed seed of a greenish colour, varying in intensity; the rest were of the ordinary greyish colour. Green and brown seeds were also found in Trice. The lint of one variety, Columbia, has been sent for examination and trial in England, and to serve as a standard against which the Mpanganya selections can be compared. If it is found that this cotton is really what is wanted, its importation and multiplication on a large scale would offer no difficulty and would be an easy and inexpensive solution of the problem of the seed supply, in this district at any rate. A fresh strain of American seed is being obtained for 1924, and will be sown to serve again as a standard of purity and quality.

(c) *Time of Planting Experiment*.—The plots displayed the extraordinary variations mentioned above and the figures are therefore mostly valueless.

(d) *Distance of Planting Experiment*.—Over most of the land the plants grew insufficiently to take advantage of the extra spacing, but in a luxuriant patch running across the centre, single plants spaced at $1\frac{1}{2}$ yards by $1\frac{1}{2}$ yards just met across the intervening space. A similar trial was carried out to see whether the crop could be sown in a continuous line, as if with a drill, and left close in the row, in order to discourage the production of vegetative side branches on the lines of what has been called "Single Stalk Culture." The experiment showed that it is perfectly feasible to plant in this way, and in one corner of the plot, where there was a normal yield, it was reported that there was quite a tendency for the suppression of monopodial (vegetative) branches.

47. *Topping Cotton Plants*.—An experiment to judge the result of topping the plants was carried out in Field No. 1, and this was more definite in its results. For one thing, the land proved to be fairly even, and for the other, a comparison can be made between five individual rows, which were topped, alternatively with five which were untopped. The average yield of the plants left untopped was 22 per cent. above the topped plots, with a standard deviation of 9.6 per cent., so that the differences between the plots may safely be considered significant, and the experiment will not be continued. It is interesting to note that this does not bear out German experience, which is reported to have attributed an increase of 12 per cent. from topping the plants. (Extracted from the Cotton Specialist's Report.)

48. *Yield tests with other crops*.—The following results were obtained :—

| | | | |
|-----------------------|-----|-----|---------------------|
| Sweet potato (ridged) | ... | ... | 6,605 lb. per acre. |
| Groundnuts (unhulled) | ... | ... | 913 " " |
| Maize | ... | ... | 2,129 " " |

BOTANIC GARDENS, DAR ES SALAAM.

49. The Head Gardener was absent on leave from April to October, and the gardens were temporarily placed under the charge of the Head Gardener, Amani Institute, on the latter's return from leave in April. The work of restoration made good progress and systematic planting was continued. Because of the difficulties of nursery work in the type of soil and with the inadequate and alkaline water supply, a complementary nursery has been established at Morogoro. Ninety-one consignments of seeds and planting material of different varieties were received from botanical stations outside the Territory, of which 29 were of economic plants and 62 of decorative. The more important of these introductions were Mesquite (*Prosopis juliflora*); Okro (*Hibiscus esculentus*); Mammee (*Mammea Americana*); *Tephrosia Hookeriana* and *T. purpurea*; *Stenotaphrum complanatum*. More time has been available this year for the cleaning and re-arrangement of paths, the growing of hedges and borders, the labelling of plants and the thinning out of trees growing too closely together. This work, together with the plantings in this and previous years, has now caused the area to reassume the distinctive appearance of a Botanic Garden, which it had lost during the previous years of war neglect.

50. The Head Gardener has carried out the following additional duties :—The laying out and maintenance of the gardens at the new Government House; the establishment of an experimental fruit orchard, consisting of varieties of pineapples, banana, pawpaw (Hawaiian and local varieties), citrus and a number of other varieties of tropical fruits; pollarding, pruning and general care of street avenues in Dar es Salaam township; plant import inspection; inspection for disease, etc., of coconut plantations on the

borders of the town; distribution of plants and seeds from the Botanic Gardens (283 plants, 25 packets of seeds and 9 bundles of cuttings); attention to correspondence dealing with certain botanical matters; fumigation and packing of material for the British Empire Exhibition.

COTTON PLOTS AT TANGA.

51. In view of the desire of both natives and non-natives to grow cotton in this district, which is generally regarded as unfavourable for the crop, the experimental cotton plots opened in 1923 were continued this season and a few additional localities were chosen. The following results are summarised from the Senior Commissioner's report :—The plots at Amani, Marimba, Pongwe and Tangata failed. Those at Tanga, Gombero and Moa gave yields much too low to be profitable. The Mnyusi plot gave a yield of 250 kgs. per acre and that at Muheza 312 kgs. per acre. It is now possible to state with some certainty that cotton should not be grown in the Usambara Hills, but that it may be grown with profit on the fertile lands along the southern base of the hills. There is little doubt also that it will not thrive well in the coastal belt. As a result of these experiments and of the success obtained by a European planter in the region, seed has been issued to native growers at the foot of the hills, and many non-native planters have taken up the crop for the first time.

AGRICULTURAL PLOTS AT MWANZA.

52. The following results were obtained on experimental plots in the Mwanza district worked by natives :—

| Crop. | Locality. | Yield per acre. |
|----------------------------------|------------------|-----------------|
| | | lb. |
| Bullrush millet (Mawelee) | Sima | 888 |
| Rice (var. Sindano) | Nyambiti | 1,320 |
| Dhall (Chiroko) | { (Interplanted) | 440 |
| Groundnuts (shelled) | { Usmao | 660 |
| Groundnuts (shelled) | Nassa | 528 |
| Sorghum millet (red) | Nera | 906 |
| Sweet potato | Usmao | 1,760 |

AGRICULTURAL PLOTS AT MOSHI.

53. At Kileo, cotton yielded at the rate of 885 kgs. (seed-cotton) per acre, the 1922 yield on the same soil at the same locality being 891 kgs. At Rombo, Proso millet gave a yield of 217 kgs. per acre and Tepary beans 48 kgs. per acre. These plots were in native fields. The Efwatakala grass plot in the township gave a good growth. The absence of the District Agricultural Officer on leave was responsible for the reduction in the number of these co-operative trials.

GOVERNMENT PLANTATIONS.

54. These are leased at the present, but receive regular supervision. The principal plantations are the old German cotton station at Miombo, Kilosa; the coffee and sisal estates at Kwamkoro and Kihuhui, Tanga; the coconut plantations in the Dar es Salaam, Tanga, Lindi, and Bagamoyo districts.

AMANI INSTITUTE.

55. A separate report on the work of the Amani Institute will be found in Appendix V.

PROGRESS OF THE CHIEF EXPORT CROPS.

COTTON.

56. The table which follows is a statement of production of lint from the crops of 1922 and 1923. The whole crop is grown and harvested within the calendar year, but as ginning extends well into the following year, the production is shown to fall under both : 1922-23, etc. The figures represent the actual output of the district, not the ginning returns, as in certain cases ginning was done for outside districts; the details of these are given in the succeeding paragraphs. A list of ginneries is given in Appendix III.

COTTON LINT PRODUCTION (BY DISTRICTS).

| District. | In lb. | | Difference per cent. |
|-------------------------------------|-----------|------------|----------------------|
| | 1922-23. | 1923-24. | |
| Morogoro | 832,970 | 1,717,301 | +106 |
| Mwanza (including Shinyanga) | 1,160,685 | 1,807,337* | + 56 |
| Rufiji | 269,493 | 264,814 | - 2 |
| Lindi | 218,032 | 261,546 | + 20 |
| Bagamoyo | 77,504 | 73,373 | - 5 |
| Kilwa | 39,796 | 124,905 | +214 |
| Dar-es-Salaam | 152,080 | 104,899 | - 31 |
| Tanga, Usambara and Moshi | 99,192 | 200,745† | +102 |
| Pangani | 4,950 | 1,716 | - 65 |
| Mahenge | 15,334 | 17,068 | + 11 |
| TOTALS | 2,870,036 | 4,573,704 | + 60 |

* Ginning not completed, 33,000 lb. included as estimate of unginned remainder.

† Tanga and Usambara, 154,330 lb. ; Moshi, 46,415 lb.

57. *Morogoro*.—Of the total output of the district (1,717,301 lb.), 272,745 lb. was ginned at Dar es Salaam. Natives in the Morogoro district produced 448,965 lb. (or 26 per cent. of the total district output), as compared with 98,666 lb. (or 12 per cent.) in 1922-23. This notable increase is attributable to strong propaganda, close instruction and the encouragement given by the Government auction system of marketing, with its good prices. As will be seen from the figures of seed distribution (paragraph 16), a still further considerable increase in native production is expected in 1924.

58. *Mwanza (including Shinyanga)*.—Of the total output of 1,807,337 lb., 54,220 lb. only was produced by non-natives, the remainder, or 97 per cent., being entirely the production of natives. The Shinyanga total did not exceed 65,000 lb. of lint. The increase over the previous season

is expected to be considerably exceeded by that of 1924 (see seed-distribution table, paragraph 16).

59. *Lindi*.—Of the total output, 248,469 lb., or 95 per cent., was produced by natives. The previous season's production by natives was 54,432 lb. Though the increase is gratifying, it would have been larger still had not the growing season been unfavourable in some of the important cotton valleys of the district, in which severe floods destroyed the first sowings in March and a subsequent drought the second sowings in April, thus necessitating a third sowing in May, which proved to be too late for a good harvest. The decline in non-native production is attributable to the outbreak of rats in the previous season, which destroyed a large part of the crops. The outbreak, however, did not recur in 1923.

60. *Bagamoyo*.—Of the total output for the district (73,373 lb.), 5,503 lb. was ginned in the Morogoro district. The non-native production was 23,056 lb., and the native 50,317 lb., or 69 per cent. of the whole. In the previous season (1922) the native production was 56,858 lb. (or 75 per cent. of the whole), which represented a large increase over the season of 1921. The larger seed-distribution in 1924 promises a renewal of the upward tendency in native production.

61. *Rufiji*.—Of the total district output of 264,814 lb., 238,579 lb. (90 per cent.) was produced by natives. A severe drought was experienced on the higher lands, which considerably depressed the yields.

62. *Kilwa*.—The entire crop (124,905 lb.) was produced by natives, as compared with a native production in 1922-23 of 39,796 lb. The decline in the previous season has thus been more than made up, while a further considerable increase is promised in 1924, judged by the greater demands for seed (table in paragraph 16).

63. *Moshi*.—Of the Moshi total (46,415 lb.), 33,891 lb. (73 per cent.) was produced by natives, as compared with 7,421 lb. for this district in 1922-23.

64. *Tanga and Usambara*.—Of the total output of these two districts (154,330 lb.), less than 4,000 lb. was produced by natives. Lindi ginned 106,326 lb. for these districts, Moshi 20,427 lb.

65. *Dar es Salaam*.—Natives produced 29,601 lb. of the total crop (104,899 lb.), or 28 per cent., as compared with 379 lb. in the previous season.

66. *Mahenge*.—Of the total output of the district (17,068 lb.), 2,299 lb. was ginned locally by hand-roller gin; 8,164 lb. was ginned at Dar es Salaam, and 6,605 lb. in the Morogoro district.

67. *Cotton Production by Natives*.—A summary is now given of the totals of production of cotton lint by natives in 1922-23 and 1923-24. It will be seen that the total increase in native production over the 1922 season was 139 per cent., and that natives produced 64·3 per cent. of the whole crop of the Territory in the 1923 season, as compared with 42·8 in the previous one.

PRODUCTION OF COTTON LINT BY NATIVES.

| District. | Lint in lb. | | Difference per cent. | Percentage of total district production. | | Percentage of total native production. | |
|-------------------------------------|-------------|-----------|----------------------|--|----------|--|----------|
| | 1922-23. | 1923-24. | | 1922-23. | 1923-24. | 1922-23. | 1923-24. |
| Morogoro | 98,666 | 448,965 | +355 | 12 | 26 | 8.1 | 15 |
| Mwanza (including Shinyanga) | 714,366 | 1,753,117 | +145 | 58 | 97 | 58.7 | 60 |
| Rufiji | 245,042 | 238,579 | — 3 | 91 | 90 | 20.1 | 8.1 |
| Lindi | 54,432 | 248,469 | +357 | 25 | 95 | 4.5 | 8.4 |
| Bagamoyo | 56,858 | 50,319 | — 12 | 75 | 69 | 4.7 | 1.7 |
| Kilwa | 39,796 | 124,905 | +214 | 100 | 100 | 3.3 | 4.3 |
| Moshi | 7,421 | 33,891 | +357 | — | 73 | 0.6 | 1.1 |
| Dar es Salaam | 379 | 29,601 | (high) | — | 28 | — | 1.0 |
| Pangani | 4,950 | 1,639 | — 67 | 100 | 100 | 0.4 | 0.05 |
| Mahenge | 6,681 | 7,725 | + 16 | — | 45 | 0.5 | 0.25 |
| Tanga and Usambara | 508 | 3,500 | +589 | — | 2 | — | 0.1 |
| TOTAL | 1,229,099 | 2,940,710 | +139 | — | — | — | — |

Percentage of total production of the Territory : 1922-23, 42.8 ; 1923-24, 64.3.

GROUNDNUTS.

68. The following table of exports represents the progress made with this crop :—

| Exports in Tons. | | | |
|------------------|-------|--------|--------|
| 1913. | 1921. | 1922. | 1923. |
| 8,961 | 8,448 | 12,518 | 16,508 |

The production and export fall within the same calendar year. The principal producing areas in 1923 were Mwanza (including Shinyanga), 7,778 tons; Tabora, 4,529 tons; Dodoma (including Kondoa Irangi), 1,927 tons.

SIMSIM.

| Exports in Tons. | | | |
|------------------|-------|-------|-------|
| 1913. | 1921. | 1922. | 1923. |
| 1,476 | 1,385 | 2,778 | 4,435 |

The chief producing districts in 1923 were Lindi, 1,727 tons; Mwanza, 581 tons; Morogoro, 317 tons.

COPRA.

| Exports in Tons. | | | |
|------------------|-------|-------|-------|
| 1913. | 1921. | 1922. | 1923. |
| 5,477 | 6,104 | 5,948 | 6,669 |

The principal producing areas in 1923 were Tanga, 1,548 tons; Mafia Island, 1,460 tons; Dar es Salaam, 1,277 tons; Bagamoyo, 1,161 tons.

COFFEE.

| Exports in Tons. | | | |
|------------------|-------|-------|-------|
| 1913. | 1921. | 1922. | 1923. |
| 1,059 | 3,827 | 4,271 | 4,047 |

Bukoba produced 2,562 tons (almost entirely native grown) in 1923; Moshi, 1,536 tons (of which 20 tons were produced by natives); Arusha, 213 tons; the remainder was produced in the Usambara district.

SISAL.

| Exports in Tons. | | | |
|------------------|-------|--------|--------|
| 1913. | 1921. | 1922. | 1923. |
| 20,834 | 7,923 | 10,224 | 12,845 |

The decline in production after the war was due to the enforced neglect and abandonment of plantations. A rapid recovery has now set in. The Tanga and Usambara districts produced 9,394 tons in 1923; Lindi district, 1,642 tons; Dar es Salaam and Morogoro, 1,509 tons; Pangani, 201 tons; Mwanza, 99 tons.

GRAINS.

73. The export of these depends entirely upon the favourableness or otherwise of the season in other parts of the East, and is no indication of the surplus available for export. The total export in 1923 was 11,786 tons, as compared with 18,912 tons in 1922. The classification includes maize, millets (mtama), rice and leguminous seeds. The principal millet exporting districts are in the south, Lindi, Kilwa and Rufiji. The chief rice districts are Mwanza, Morogoro, Lindi, Rufiji and Mahenge. The maize export in 1923 was 726 tons, in 1922, 2,152 tons; rice, 2,886 tons in 1923, 1,526 in 1922; millets, 6,098 in 1923, 10,025 in 1922.

GUMS.

74. The export of gum arabic in 1923 was 11,378 cwts. (entirely from Mwanza and Shinyanga), in 1922, 7,389 cwts.; of gum copal, 3,362 cwts. in 1923, 2,803 in 1922. Bagamoyo district is the largest exporter of gum copal; minor districts are Lindi and Rufiji.

RUBBER.

75. A slight revival of export took place in 1923 with the temporary rises in the oversea markets, plantation rubber (Ceara) totalling 1,000 cwts. (in 1922, 186 cwts.) and wild rubber 903 cwts. (in 1922, 39 cwts.).

CONTROL OF PLANT PESTS AND DISEASES.

76. The measures taken for control of cotton pests and diseases consisted of fumigation of seed, compulsory uprooting and burning of plants after harvest, and compulsory export or destruction of all seed remaining on completion of sowing. The fumigation of the fresh seed imported from Uganda was, on the advice of the Entomologist, considered to be unnecessary, and this work was confined to seed of the old stock sown by non-natives in the Morogoro district. The uprooting and burning campaign was carried out in 1923 under the adverse circumstances of the absence on leave of four District Agricultural Officers, after a crop which had increased over the previous year by 50 per cent. District Administrative Officers in these cases took charge of the subordinate staffs of native instructors, who act as inspectors for this purpose. The importance of the measure is realised by the Administrative staff, but their multifarious duties prevented them giving it the thorough attention which it requires. The pest incidence continued low in 1923, and this remains one of the most satisfactory features of the industry. Educational measures have brought about the realisation, among both native and non-native growers, of the value of uprooting and burning in keeping down insect pests, but it must be said that in most districts compulsory measures and prosecutions under the Regulations still prove to be necessary, and in some, European growers have been unable to resist the temptation of ratooning the cotton for a second growth. The destruction of seed remaining after sowing, unless exported, was only partially carried out. The matter is complicated by the circumstance that in districts from which export is not possible certain ginneries operate for nine or ten months of the year, well past the sowing season of the fresh crop. This condition will disappear with the increase in the number of ginneries which is now coming about. On the whole, the results of these measures in 1923 were not unsatisfactory, despite the unavoidable lack of supervision in carrying them out. At the time of the close of the preparation of this report, the new crop is in most parts well in the bolling stage and is generally reported clean. The Coconut Regulations, designed for field sanitation, have been enforced with increasing strictness with the rise in the price of copra, in respect particularly of those plantations which had suffered neglect during and immediately after the war, but only in the districts of Dar es Salaam, Bagamoyo and Lindi. The staff has not been available for the other coastal districts.

77. *Yellow Stain of Cotton (an internal boll disease).*—The following notes have been supplied by the Cotton Specialist of the Empire Cotton Growing Corporation, Mr. R. C. Wood:—

This disease has proved to be fairly widespread in this Territory. It is due, primarily, to a fungus, probably a species of *Eremothecium*,

which is conveyed to the boll during the act of piercing the young boll by one of the cotton staining bugs. The disease is known in the West Indies, and has been worked out there by Nowell (West Indian Bulletin, Vol. 16, p. 152-9, pp. 203-35; Vol. 17, p. 26); the insect doing the damage there is probably *Dysdercus*.

The appearance of the disease is characteristic. The lint becomes yellow in colour and extremely weak. This staining is most marked in the lower part of the boll, and in close proximity to each seed. At times, when the lint is picked out of the opened boll, one or two seeds will be left in the bottom of the boll, and these will be found affected. Sometimes a few fibres stick to the edges of the bolls, which turn back as they dry; the boll then has a characteristic "drawn" appearance, which contrasts with the fluffiness of a normal boll. The inside of the boll is stained a vivid yellow, instead of being the normal buff colour.

The identification of the disease has been done on material sent to the Imperial College of Science, and is definite. In confirmation of this view, is the result of an experiment carried out by the Cotton Specialist at Mpanganya last season. Two lots, of two plants each, were, when half grown, covered with frames of mosquito gauze. Into one of these, sucking insects of different kinds were introduced from time to time. The plants in the other cage formed the control. At the end of the season all the bolls from the control plants were healthy; those from the cage where the bugs were introduced produced practically all stained bolls. The disease is important as it has such a serious effect on the strength of the fibre, and a careful watch should be kept for it. It is probable that, besides the bug and the fungus, conditions must be favourable for the development of the latter, and it seems likely that dull weather, causing slow opening of the bolls and damp conditions inside, are favourable.

78. *Rosette or Leaf-curl Disease of Groundnuts*.—This disease, reported from many parts of Africa, is prevalent in the Mwanza, Tabora and Lindi districts, and causes great damage. It has also been found in other parts of the Territory, and was the subject of a special study by Dr. Zimmermann, the former Director of the Amani Institute. The following information in respect of this and another disease has been supplied by the Director of the Imperial Bureau of Mycology:—

The cause of the disease is unknown. No fungus or other parasite has been detected, nor does it appear to be connected with the chemical or physical characters of the soil. Experiments were carried out at Amani for several years to test the effects of fertilizers and the like on the disease, but, so far as I know, without result. It is, I think, very probable that this is one of the so-called virus diseases allied to the leaf-curl of potato, tomato, etc. These diseases are believed to be caused by an ultra-microscopical organism. They are known to be carried from the diseased to healthy plants by insects (usually green-fly). No remedial measures are known except to keep the insects down as far as possible and to pull out and destroy all early cases of the disease.

The black or dark-brown round spots found on some of the leaves are caused by the fungus *Cercospora personata* (B. and C.) Ellis (*Septogloeum arachidis*, Rac.), one of the most destructive parasites of this crop known. It occurs practically everywhere the crop is grown. The only measures that have been successful against it are the renewal of seed from outside sources (West Africa, Japan, Mauritius, etc.) and the growing of rapidly maturing varieties.

WORK OF THE ENTOMOLOGIST.

79. In the absence of the Entomologist on leave, his Annual Report has not been available. In addition to (1) the investigational work of his office and newly-constructed laboratory, dealing chiefly with the cotton pests of the Territory, coffee pests, weevil-infestation of grains and millets in native farm stores and bins, improvement in quality of beeswax; (2) advisory work by correspondence following examination and identification of pests; (3) assistance in framing control legislation; the Entomologist undertook a journey of inspection of the coffee industry in the Kilimanjaro and Meru areas. The principal matters of importance extracted from his report are as follows:—

(a) Of the insect pests of coffee, thrips, coffee bug (*Antestia variegata*, var. *lineaticollis*) and white borer (*Anthores leuconotus*, Pasi.) are the most dangerous; bostrychid borer (*Capate* sp.), berry moth, scale insects, grasshoppers and root nematode also require or may require control; whilst yellow borer (*Nitocris usambiscus*, Kolbe), leaf-miner (*Lemoptera coffeella*, Stain.)—except at the higher altitudes—bean borer (*Stephanodores hampei*, Ferr.) and leaf beetles are practically negligible or absent.

(b) Of diseases of coffee, coffee rust (*Hemileia vastatrix*) is general, but worst at the lower altitudes, after the chief rains and where there is close planting; and die-back, a general result of adverse conditions, will be reduced by proper care and cultivation.

(c) The work of European planters against pests is generally good.

(d) Native coffee cultivation may become dangerous to European cultivation only in respect of coffee borer and coffee bug, this danger being non-existent in relation to the two other chief enemies of coffee, thrips and coffee rust.

(e) The native cultivator can deal safely with the pests and diseases of coffee by simple means, provided that he is given adequate instruction and inspection and good planting material, and prevented from planting coffee at the lower altitudes or among European estates.

(f) Both European and native growers are in want of instruction regarding cultivation and irrigation, the native particularly with respect to the choice of land for planting and of inter-crops, and the proper method of utilizing his banana groves, hillsides and irrigation water for coffee growing.

(g) Even the European preparation of coffee in these areas is poor and requires considerable reformation.

(h) The coffee on reverted and Government farms should either be given proper care or be destroyed.

AGRICULTURAL LEGISLATION.

80. *Cotton*.—Legislation, rules or notices were published as follows:—

Schedule of Fees, as Government Notice No. 138 of June 27th, 1923.

Schedule of Fees (amendment), as Government Notice No. 148 of July 11th, 1923.

Sundry notices, as Government Notice No. 227 and General Notice No. 581.

Plant Protection.—Legislation, rules and notices were published as follows:—

Plant Pests and Disease Ordinance No. 5 of 1923 (amending Plant Pests and Disease Ordinance No. 38 of 1921), in *Gazette* for February 2nd, 1923.

Plant Pest and Disease (Import) Regulations, 1923, in *Gazette* for July 27th, 1923.

BRITISH EMPIRE EXHIBITION.

81. The Director was appointed Chairman of the Central Committee of the Territory for the organisation of its exhibit at the British Empire Exhibition, and Mr. A. L. B. Bennett, Junior Clerk in the Department, acted as Secretary.

The work of publicity, compilation of the Exhibition Handbook for the Territory, collection of funds and of the exhibits devolved mainly upon the Director and the Head Office of the Department. The sum of £2,000 was contributed by the Government and £4,278 locally and in England. The Government agricultural exhibits comprised 325 articles from the different districts of the Territory; in addition, 38 plantation owners dispatched 82 articles, and 28 timber and furniture exhibits were sent by six firms.

METEOROLOGICAL MATTERS.

82. During the year the number of stations provided with meteorological equipment was brought up to seventy-nine. Readings of rainfall and of maximum and minimum temperature were given by these stations, but forty-one only were able to take regular daily records. Appendix IV gives the monthly rainfall for these stations for the calendar year 1923.

REVENUE, FINANCIAL YEARS 1922-23, 1923-24.

83. This was as follows:—

| | 1922-23. | | 1923-24. | |
|---|-----------|------------|-----------|------------|
| | Shs. | Total Shs. | Shs. | Total Shs. |
| Fumigation of cotton seed :— | | | | |
| Morogoro | 201·60 | | 360·40 | |
| Dar es Salaam | 28·00 | | — | |
| | | 229·60 | | 360·40 |
| Receipts from Government Plantations :— | | | | |
| Mahenge | 48·00 | | 48·00 | |
| Dar es Salaam | 30,736·16 | | 26,521·06 | |
| Kilosa | 366·00 | | 209·00 | |
| Tabora | 648·03 | | 456·63 | |
| Bagamoyo | 14,355·24 | | 13,255·00 | |
| Kigoma | 447·56 | | 544·00 | |
| Utete | 377·00 | | 683·00 | |
| Kilwa | 341·18 | | 174·29 | |
| Dodoma | 168·82 | | 58·00 | |
| Mkalama | 87·52 | | — | |
| Lushoto | 321·00 | | 26·84 | |
| Lindi | 2,120·00 | | 1,141·95 | |
| Mikindani | 309·20 | | 248·67 | |
| Kasanga | 98·64 | | 95·00 | |
| Pangani | 949·18 | | 1,227·38 | |
| Tanga | 29,566·50 | | 12,557·00 | |
| Mwanza | — | | 335·00 | |
| Myombo Government Farm ... | — | | 1,000·00 | |
| | | 80,940·03 | | 58,580·82 |
| Miscellaneous Sales of Produce and Planting Material :— | | | | |
| Amani Institute | 1,997·08 | | 2,231·33 | |
| Mpanganya Agricultural Station | 1,458·80 | | 2,318·38 | |
| Morogoro Agricultural Station... | — | | 685·73 | |
| Botanic Gardens, Dar es Salaam | — | | 103·00 | |
| Headquarters Office, Dar es Salaam | — | | 495·00 | |
| | | 3,455·88 | | 5,833·44 |
| TOTALS ... | — | 84,625·51 | — | 64,774·66 |

BIOLOGICAL AND AGRICULTURAL INSTITUTE, AMANI.

84. The work has continued to be chiefly the care of the Institute and the Estate, with distribution of planting material (included in Appendix I). The Director, Mr. A. Leechman, who had held the post since December 12, 1919, went on leave in December, 1923, prior to abolition of post, the Head Gardener, Mr. F. M. Rogers, taking charge. An abstract of the latter's Report is given in Appendix V.

H. WOLFE,
Ag. Director.

APPENDIX I.

DISTRIBUTION OF PLANTING MATERIAL IN THE FIFTEEN
MONTHS ENDING 31ST MARCH, 1924.

ECONOMIC PLANTS.

| | | | | | |
|--------------------------------------|-----|-----|-----|-----|-----------------------|
| Cotton Seed (for 1923 season) | ... | ... | ... | ... | 481 tons. |
| „ (for 1924 season) | ... | ... | ... | ... | 1,169 tons. |
| Groundnuts | ... | ... | ... | ... | 4,160 lb. |
| Maize | ... | ... | ... | ... | 708 lb. |
| Beans | ... | ... | ... | ... | 3,965 lb. |
| Peas | ... | ... | ... | ... | 224 lb. |
| Coffee | ... | ... | ... | ... | 759 lb. |
| Wheat | ... | ... | ... | ... | 1,015 lb. |
| Millet (Sorghum) | ... | ... | ... | ... | 1,180 lb. |
| Millet (Proso) | ... | ... | ... | ... | 280 lb. |
| Simsim | ... | ... | ... | ... | 374 lb. |
| Potatoes | ... | ... | ... | ... | 4,480 lb. |
| Gram (Dhall, Chiroko) | ... | ... | ... | ... | 400 lb. |
| Chillies | ... | ... | ... | ... | 100 lb. |
| Tobaccos | ... | ... | ... | ... | 1 packet. |
| <i>Aleurites montana</i> | ... | ... | ... | ... | 40 lb. |
| <i>A. Fordii</i> | ... | ... | ... | ... | 4 lb. |
| <i>Prosopis juliflora</i> | ... | ... | ... | ... | 4 packets. |
| <i>Cinchona</i> | ... | ... | ... | ... | 23 packets. |
| Efwatakala grass | ... | ... | ... | ... | 13 lb. |
| Ginger rhizomes | ... | ... | ... | ... | 3 lb. |
| Fruit trees and miscellaneous plants | ... | ... | ... | { | 251 plants. |
| | | | | } | 404 packets of seeds. |
| Spices | ... | ... | ... | ... | 16 packets. |

DECORATIVE PLANTS.

| | | | | | |
|-------------------------------------|-----|-----|-----|-----|------------------------|
| Palms | ... | ... | ... | ... | 23. |
| Shade trees and windbreaks | ... | ... | ... | ... | 39 packets. |
| Ornamental trees, shrubs and plants | ... | ... | ... | { | 280 packets. |
| | | | | } | 27 crates of cuttings. |
| | | | | | 301 plants. |

APPENDIX II.

SEEDS DISTRIBUTION.

Seeds available at the Biological and Agricultural Institute, Amani.

| | | | |
|----------------------|----------------------------------|----------------------|-------------------------------|
| 1. Kei apple | <i>Aberia caffra</i> | 69. Kitul palm | <i>Caryota urens</i> |
| 2. Devil's cotton | <i>Abroma augusta</i> | 70. Mexican apple | <i>Casimiroa edulis</i> |
| 3. Catechu | <i>Acacia Catechu</i> | 71. | <i>Cassia bacillaris</i> |
| 4. | " <i>Cunninghamii</i> | 72. | <i>Cassia laevigata</i> |
| 5. Wattle bark | " <i>decurrens</i> | 73. | " <i>siamea</i> |
| 6. Cassie | " <i>farnesiana</i> | 74. | " <i>timorensis</i> |
| 7. Gum arabic | " <i>Senegal</i> | 75. Panama rubber | <i>Castilloa elastica</i> |
| 8. Palm | <i>Acanthophoenix alba</i> | 76. | <i>Casuarina distyla</i> |
| 9. | <i>Acer oblongum</i> | 77. Whistling Willie | " <i>equisetifolia</i> |
| 10. | <i>Acokanthera spectabilis</i> | 78. Forest oak | " <i>torulosa</i> |
| 11. Sapodilla plum | <i>Achras Sapota</i> | 79. Arabian tea | <i>Catha edulis</i> |
| 12. | <i>Adenanthera microsperma</i> | 80. West Indian | <i>Cedrela odorata</i> |
| 13. Barricari seeds | " <i>pavonina</i> | cedar | |
| 14. | <i>Afzelia quanzensis</i> | 81. | " sp. |
| 15. | " <i>bijuga</i> | 82. | " <i>Toona</i> |
| 16. | <i>Albizzia fastigiata</i> | 83. | <i>Celosia argentea</i> |
| 17. Lebbek; Siris | " <i>Lebbek</i> | 84. Cock's comb | " <i>cristata</i> , var. |
| 18. | " <i>moluccana</i> | | <i>pyramidalis</i> |
| 19. | " <i>procera</i> | 85. Cornflower | <i>Centaurea Cyanus</i> |
| 20. | " <i>stipulata</i> | 86. Star apple | <i>Chrysophyllum Cainito</i> |
| 21. Candle nut | <i>Aleurites triloba</i> | 87. | <i>Cinchona Ledgeriana</i> |
| 22. | <i>Allanblackia Stuhlmannii</i> | | x <i>C. succirubra</i> |
| 23. | <i>Allamanda nerifolia</i> | 88. | <i>Cinchona Ledgeriana</i> |
| 24. | <i>Aloe saponaria</i> | 89. | " <i>robusta</i> |
| 25. | " sp. | 90. Red bark | " <i>succirubra</i> |
| 26. Cherimoyer | <i>Anona Cherimolia</i> | 91. Camphor | <i>Cinnamomum Camphora</i> |
| 27. Soursop | " <i>muricata</i> | 92. Cinnamom | " <i>zeylanicum</i> |
| 28. Bullock's heart | " <i>reticulata</i> | 93. Sweet orange | <i>Citrus Aurantium</i> |
| 29. | <i>Antidesma Ghesaembilla</i> | 94. Seville orange | " " |
| 30. | <i>Antirrhinum majus</i> : vars. | | var. <i>Bigaradia</i> |
| 31. | <i>Araucaria Bidwillii</i> | 95. Grape fruit | " <i>decumana</i> |
| 32. | " <i>brasiliiana</i> | 96. Citron | " <i>medica</i> |
| 33. Areca nut palm | <i>Areca Catechu</i> | 97. Sweet lime | " " var. <i>Limetta</i> |
| 34. Palm | " <i>triandra</i> | 98. Lemon | " " " <i>Limonum</i> |
| 35. Palm | <i>Arenga saccharifera</i> | 99. | " <i>nobilis</i> |
| 36. | <i>Aristolochia elegans</i> | 100. Mandarin orange | " " var. <i>major</i> |
| 37. | <i>Artocarpus Blumei</i> | 101. Wampee | <i>Clausena Wampi</i> |
| 28. Bread fruit | " <i>incisa</i> | 102. | <i>Clerodendron sinuatum</i> |
| 39. Jak fruit | " <i>integrifolia</i> | 103. Arabian coffee | <i>Coffea arabica</i> |
| 40. | <i>Asparagus officinalis</i> | 104. Bukoba coffee | " <i>bukobensis</i> |
| 41. | " <i>plumosus</i> | 105. | " <i>excelsa</i> |
| 42. | " <i>Sprengeri</i> | 106. Liberian coffee | " <i>liberica</i> |
| 43. Palm | <i>Attalea macrocarpa</i> | 107. | " <i>micrantha</i> |
| 44. Carambola | <i>Averrhoa Carambola</i> | 108. | " <i>Quilloa</i> |
| 45. | <i>Baphia Kirkii</i> | 109. | " <i>robusta</i> |
| 46. | <i>Bauhinia acuminata</i> | 110. | " <i>stenophylla</i> |
| 47. Trincomalee wood | <i>Berria Ammonilla</i> | 111. Kola nut | <i>Cola acuminata</i> |
| 48. | <i>Bersama usambarica</i> | 112. | " <i>nitida</i> |
| 49. Annatto | <i>Bixa Orellana</i> | 113. | " <i>usambarensis</i> |
| 50. China grass | <i>Boehmeria nivea</i> | 114. | " <i>vera</i> |
| 51. | <i>Bombax macrocarpum</i> | 115. | <i>Cordia Gerascanthus</i> |
| 52. | <i>Bridelia micrantha</i> | 116. | <i>Cosmos bipinnatus</i> |
| 53. | <i>Brunfelsia americana</i> | 117. Croton oil | <i>Croton Tigilium</i> |
| 54. Divi-divi | <i>Caesalpinia coriaria</i> | 118. | " <i>megalocarpus</i> |
| 55. Barbados pride | " <i>pulcherrima</i> | 119. | <i>Cryptomeria japonica</i> , |
| 56. | <i>Calathea zebrina</i> | | var. <i>araucarioides</i> |
| 57. | <i>Calliopsis atrosanguinea</i> | 120. | " <i>glabra</i> |
| 58. | <i>Callitris robusta</i> | 121. Cypress | <i>Cupressus Benthami</i> |
| 59. Mtondoo | <i>Calophyllum Inophyllum</i> | 122. | " <i>funbris</i> |
| 60. China tea | <i>Camellia theifera</i> | 123. | " " var. <i>glauca</i> |
| 61. Ylang-Ylang | <i>Cananga odorata</i> | 124. | " <i>lusitanica</i> |
| 62. | <i>Canarium commune</i> | 125. | " <i>macrocarpa</i> |
| 63. | " <i>polyphyllum</i> | 126. | " <i>sempervirens</i> |
| 64. | <i>Cannas</i> (mixed vars.) | 127. Turmeric | <i>Curcuma longa</i> |
| 65. Pawpaw | <i>Carica Papaya</i> | 128. Tree tomato | <i>Cyphomandra betacea</i> |
| 66. Panama hat plant | <i>Carludovica incisa</i> | 129. | <i>Dahlias</i> (Cactus mixed) |
| 67. | " " " <i>palmata</i> | 130. | " (Single ") |
| 68. Palm | <i>Caryota mitis</i> | 131. | <i>Datura arborea</i> |

Seeds available at the Biological and Agricultural Institute, Amani (Contd).

| | | | |
|--------------------------------|---|--------------------------|--------------------------------------|
| 132. | <i>Derris dalbergioides</i> | 208. | <i>Leea sundaica</i> |
| 133. Yam | <i>Dioscorea alata</i> | 209. | <i>Leucaena glauca</i> |
| 134. | " <i>abyssinica</i> | 210. | <i>Lilium regale</i> |
| 135. | " <i>bulbifera</i> | 211. Palm | <i>Livistona australis</i> |
| 136. | <i>Dipterocarpus trinervis</i> | 212. Palm | " <i>chinensis</i> |
| 137. Pigeon berry | <i>Duranta Plumieri</i> | 213. | <i>Lucuma Rivicoa</i> |
| 138. Durian | <i>Durio Zibethinus</i> | | var. <i>angustifolia</i> |
| 139. Oil palm | <i>Elaeis guineensis</i> | 214. Lupins | <i>Lupinus luteus</i> , vars |
| 140. Cardamom | <i>Elettaria Cardamomum</i> | 215. Mango | <i>Mangifera indica</i> |
| 141. Cycad | <i>Encephalartos Hildebrandtii</i> | 216. | <i>Manihot dichotoma</i> |
| | | 217. Ceara rubber | " <i>Glaziovii</i> |
| 142. Rain Tree | <i>Enterolobium Saman</i> | 218. Arrowroot | <i>Maranta arundinacea</i> |
| 143. Loquat | <i>Eriobotrya japonica</i> | 219. Palm | <i>Martinezia caryotaefolia</i> |
| 144. Kapok | <i>Eriodendron anfractuosum</i> | 220. | <i>Mascarenhasia elastica</i> |
| 145. | <i>Eriodendron</i> sp. | 221. | <i>Melaleuca hypericifolia</i> |
| 146. Immortel | <i>Erythrina tomentosa</i> | 222. Cajeputi | " <i>Leucadendron</i> |
| 147. Anauca, bocare | " <i>velutina</i> | 223. Champak | <i>Michelia Champaca</i> |
| 148. Sassy bark | <i>Erythrophleum guineense</i> | 224. Sensitive plant | <i>Mimosa pudica</i> |
| 149. Coca | <i>Erythroxylon Coca</i> | 225. Calabash nutmeg | <i>Monodora myristica</i> |
| 150. | " <i>Coca</i> , var. <i>nova-granatense</i> | 226. Horse radish tree | <i>Moringa pterygosperma</i> |
| | <i>Eucalyptus angulosa</i> | 227. Manila hemp | <i>Musa textilis</i> |
| 151. | " <i>amygdalina</i> | 228. | <i>Myrica mexicana</i> |
| 152. | " <i>citriodora</i> | 229. | <i>Nicotiana affinis</i> |
| 153. | " <i>corymbosa</i> | 230. Palm | <i>Oreodoxa oleracea</i> |
| 154. | " <i>corymbosa</i> | 231. | <i>Pandanus Stuhlmannii</i> |
| 155. | " <i>corymbosa</i> | 232. | <i>Parinarium Holstii</i> |
| 156. | " <i>eximia</i> | 233. Granadilla | <i>Passiflora edulis</i> |
| 157. Blue gum | " <i>Globulus</i> | 234. | " <i>quadrangularis</i> |
| 158. | " <i>maculata</i> | 235. | <i>Pavetta</i> sp. |
| 159. | " <i>paniculata</i> | 236. | <i>Paysona Leerii</i> |
| 160. | " <i>resinifera</i> | 237. | <i>Peltophorum dasyrachis</i> |
| 161. | " <i>robusta</i> | 238. | <i>Pentas coccinea</i> |
| 162. | " <i>rostrata</i> | 239. | " <i>purpurea</i> |
| 163. | " <i>salubris</i> | 240. Avocado pear | <i>Persea gratissima</i> |
| 164. | " <i>Stuartiana</i> | 241. Palm | <i>Phoenix canariensis</i> |
| 165. Clove | <i>Eugenia caryophyllata</i> | 242. | " <i>sylvestris</i> |
| 166. | " <i>domestica</i> | 243. New Zealand hemp | <i>Phormium tenax</i> |
| 167. Roseapple | " <i>jaranica</i> | 244. Otaheite gooseberry | <i>Phyllanthus distichus</i> |
| 168. Malay apple | " <i>malaccensis</i> | | |
| 169. | " <i>owariensis</i> | 245. Cape gooseberry | <i>Physalis peruviana</i> |
| 170. Pitanga cherry | " <i>uniflora</i> | 246. | <i>Pilocarpus pennatifolius</i> |
| 171. Bark-cloth tree of Uganda | <i>Ficus chlamydodora</i> | 247. Jaborandi | " <i>racemosus</i> |
| 172. Indian fig | " <i>indica</i> | 248. | <i>Pimenta acris</i> |
| 173. | " <i>nitida</i> | 249. Black pepper | <i>Piper nigrum</i> |
| 174. | <i>Flacourtia cataphracta</i> | 250. Turpentine tree | <i>Pistacia Terebinthus</i> |
| 175. Governor plum | " <i>Ramontchi</i> | 251. | <i>Pithecolobium dulce</i> |
| 176. | " <i>Rukam</i> | 252. | " <i>Unguis-cati</i> |
| 177. Lagos silk rubber | <i>Funtumia elastica</i> | 253. | <i>Pittosporum undulatum</i> |
| 178. | <i>Garcinia ferrea</i> | 254. | <i>Pleomele elliptica</i> |
| 179. | " <i>Xanthochymus</i> | 255. | <i>Podocarpus usambarensis</i> |
| 180. | <i>Gliricidia maculata</i> | 256. Brazilian guava | <i>Psidium Cattleianum</i> |
| 181. | <i>Gloriosa simplex</i> | 257. Guava | " <i>Guava</i> |
| 182. | <i>Grevillea Banksii</i> | 258. Red guava | <i>Psidium Guava</i> , var. |
| 183. | " <i>Hilliana</i> | | <i>pomiferum</i> |
| 184. Silky oak | " <i>robusta</i> | 259. White guava | " var. <i>pyriferum</i> |
| 185. Logwood | <i>Haematoxylon campechianum</i> | 260. | " <i>pumilum</i> |
| 186. Cherry pie | <i>Heliotropium peruvianum</i> | 261. Chinese guava | " <i>sinensis</i> |
| 187. Lemon lily | <i>Hemerocallis aurantiaca</i> | 262. Palm | <i>Ptychococcus paradoxus</i> |
| 188. Para rubber | <i>Hevea brasiliensis</i> | 263. | <i>Randia sericantha</i> |
| 189. Roselle sorrel | <i>Hibiscus Sabdariffa</i> | 264. Raffia palm | <i>Raphia pedunculata</i> |
| 190. | <i>Hippeastrum equestre</i> | 265. | " sp. |
| 191. | <i>Hovenia dulcis</i> | 266. Travellers' tree | <i>Ravenala madagascariensis</i> |
| 192. Sandbox tree | <i>Hura crepitans</i> | 267. Japan wax | <i>Rhus succedanea</i> |
| 193. Paraguay tea | <i>Ilex paraguensis</i> | 268. Arum lily | <i>Richardia africana</i> |
| 194. | <i>Ipomoea Bona-nox</i> | 269. | <i>Russelia juncea</i> |
| 195. | " <i>hederacea</i> | 270. | <i>Salvia splendens</i> |
| 196. | " <i>centrocaulis</i> | 271. | <i>Sanchezia nobilis</i> |
| 197. | " <i>versicolor</i> | 272. Soap berry | <i>Sapindus Saponaria</i> |
| 198. | <i>Iresine Herbstii</i> | 273. | <i>Sapium sebiferum</i> |
| 199. | <i>Jacaranda ovalifolia</i> | 274. | <i>Schefflerodendron usambarense</i> |
| 200. Columba root | <i>Jateorhiza Columba</i> | 275. | <i>Schizolobium excelsum</i> |
| 201. Palm | <i>Jubaea spectabilis</i> | 276. Chayote: choco | <i>Sechium edule</i> |
| 202. Bermuda cedar | <i>Juniperus bermudiana</i> | 277. | <i>Solanum seafortianum</i> |
| 203. Usambara cedar | " <i>procera</i> | 278. Tree solanum | " <i>Wrightii</i> |
| 204. Queen's flower | <i>Lagerstroemia Flos-reginae</i> | 279. | <i>Spondias dulcis</i> |
| 205. Rubber vine | <i>Landolphia Kirkii</i> | 280. Hog plum | " <i>lutea</i> |
| 206. | " <i>Stolzii</i> | 281. | <i>Statice sinuata</i> |
| 207. | " sp. | 282. Stave wood | <i>Sterculia foetida</i> |

Seeds available at the Biological and Agricultural Institute, Amani (Contd.).

| | | | |
|--------------------|--------------------------------|-------------|-------------------------------|
| 283. | <i>Strobilanthes duerianus</i> | 292. | <i>Tetrapleura Thonningii</i> |
| 284. | <i>Syncarpia laurifolia</i> | 293. Cocoa | <i>Theobroma Cacao</i> |
| 285. | <i>Tabernaemontana Holstii</i> | 294. | <i>Thevetia nerifolia</i> |
| 286. | <i>Tecoma stans</i> | 295. Okwa | <i>Treculia africana</i> |
| 287. Teak | <i>Tectona grandis</i> | 296. | <i>Vinca alba</i> |
| 288. Mkweme | <i>Telfairia pedata</i> | 297. | " <i>rosea</i> |
| 289. | <i>Tephrosia Vogelii</i> | 298. | <i>Widdringtonia Whytei</i> |
| 290. Indian Almond | <i>Terminalia Catappa</i> | 299. | <i>Zephyranthes carinata</i> |
| 291. | <i>Terminalia Chebula</i> | 300. Ginger | <i>Zingiber officinalis.</i> |

F. M. ROGERS,
Head Gardener.

Seeds available at the Agricultural Station, Morogoro.

| | | | |
|----------------------|---------------------------------|---------------------|------------------------------------|
| 1. Red sandalwood | <i>Adenanthera pavonina</i> | 18. Passion fruit | <i>Passiflora edulis</i> |
| 2. Whistling Willie | <i>Casuarina equisetifolia</i> | 19. Mango | <i>Mangifera indica</i> |
| 3. West Indian cedar | <i>Cedrela odorata</i> | 20. Ceara rubber | <i>Manihot Glaziovii</i> |
| 4. Silky oak | <i>Grevillea robusta</i> | 21. Roselle | <i>Hibiscus Sabdariffa</i> |
| 5. Kapok | <i>Eriodondron anfractuosum</i> | 22. Star apple | <i>Chrysophyllum Caimi to</i> |
| 6. Oil palm | <i>Elaeis guineensis</i> | 23. | <i>Cassia siamea</i> |
| 7. Physic nut | <i>Jatropha curcas</i> | 24. Indian shot | <i>Cannas (mixed vars)</i> |
| 8. Hog plum | <i>Spondias lutea</i> | 25. Annatto | <i>Bixa Orellana</i> |
| 9. Loquat | <i>Eriobotrya japonica</i> | 26. Sweet orange | <i>Citrus Aurantium</i> |
| 10. Pawpaw | <i>Carica Papaya</i> | 27. Seville orange | " " var. <i>Bigaradia</i> |
| 11. Pomegranate | <i>Punica Granatum</i> | 28. Shaddock | " <i>decumana</i> |
| 12. Soursop | <i>Anona muricata</i> | 29. Citron | " <i>medica</i> |
| 13. Carambola | <i>Averrhoa Carambola</i> | 30. Sweet lime | " var. <i>Limetta</i> |
| 14. Brazilian guava | <i>Psidium Cattleianum</i> | 31. Lemon | " var. <i>Limonum</i> |
| 15. Peruvian guava | " <i>Guava</i> var. | 32. Mandarin orange | " <i>nobilis</i> var. <i>major</i> |
| 16. | " <i>pumilum</i> | 33. Flamboyante | <i>Poinciana regia</i> |
| 17. Chinese guava | " <i>sinensis</i> | 34. Tamarind | <i>Tamarindus indica</i> |

A. E. HAARER,
District Agricultural Officer.

Seeds available at the Botanic Gardens, Dar es Salaam.

| | | | |
|--------------------------|------------------------------------|----------------------|----------------------------------|
| 1. Baobab | <i>Adansonia digitata</i> | 28. Rain tree | <i>Enterolobium Saman</i> |
| 2. Barricari seeds | <i>Adenanthera pavonina</i> | 29. Java plum | <i>Eugenia Jambolanum</i> |
| 3. | <i>Azefia quanzensis</i> | 30. | <i>Ficus Bussei</i> |
| 4. | " <i>bijuga</i> | 31. | " <i>Volkensii</i> |
| 5. Lebbek, Siris | <i>Albizia Lebbek</i> | 32. Logwood | <i>Haematoxylon campechianum</i> |
| 6. Cashew nut | <i>Anacardium occidentale</i> | 33. | <i>Hyophorbe Verschaffeltii</i> |
| 7. Soursop | <i>Anona muricata</i> | 34. Coral flower | <i>Jatropha multifida</i> |
| 8. Custard apple | " <i>reticulata</i> | 35. Cucumber tree | <i>Kigelia aethiopica</i> |
| 9. Sweet sop | " <i>squamosa</i> | 36. Henna | <i>Lawsonia mermis</i> |
| 10. | <i>Antigonon leptopus</i> | 37. Pride of India | <i>Melia Azedarach</i> |
| 11. Jak fruit | <i>Artocarpus integrifolia</i> | 38. Horseradish tree | <i>Moringa pterygosperma</i> |
| 12. | <i>Baphia Kirkii</i> | 39. | <i>Pandanus livingstonianus</i> |
| 13. | <i>Bauhinia acuminata</i> | 40. | <i>Peltophorum ferrugineum</i> |
| 14. Annatto | <i>Bixa Orellana</i> | 41. | <i>Pithecolobium Unguis-cati</i> |
| 15. Divi-divi | <i>Caesalpinia coriaria</i> | 42. Flamboyante | <i>Poinciana regia</i> |
| 16. Barbados pride | " <i>pulcherrima</i> | 43. Traveller's tree | <i>Ravenala madagascariensis</i> |
| 17. Mtondoo | <i>Calophyllum Inophyllum</i> | 44. Soap berry | <i>Sapindus saponaria</i> |
| 18. | <i>Caryota mitis</i> | 45. | <i>Schizolobium excelsum</i> |
| 19. | <i>Cassia siamea</i> | 46. | <i>Solanum seafortianum</i> |
| 20. Whistling Willie | <i>Casuarina equisetifolia</i> | 47. | <i>Sorindeia obtusifoliata</i> |
| 21. | <i>Clitoria ternatea</i> | 48. | <i>Sterculia alata</i> |
| 22. Seaside grape | <i>Coccoloba uvifera</i> | 49. Stave wood | " <i>foetida</i> |
| 23. Calabash tree | <i>Crescentia Cujete</i> | 50. | <i>Strychnos Volkensii</i> |
| 24. | <i>Cryptostegia grandiflora</i> | 51. Tamarind | <i>Tamarindus indica</i> |
| 25. Rosewood of S. India | <i>Dalbergia latifolia</i> | 52. Teak | <i>Tectona grandis</i> |
| 26. Oil palm | <i>Elaeis guineensis</i> | 53. Indian almond | <i>Terminalia Catappa</i> |
| 27. | <i>Encephalartos Hildebrandtii</i> | 54. | <i>Terminalia Arjuna</i> |
| | | 55. Lucky bean | <i>Thevetia nerifolia</i> |

T. H. MARSHALL,
Head Gardener.

The above seeds may be obtained from the stations mentioned in packets at Shs. 0/50 or Shs. 1/00. All requests for seeds should be accompanied by a remittance in full payment for them.

A. H. KIRBY,
Director of Agriculture.

APPENDIX III.

GINNERIES IN OPERATION DURING THE SEASON 1923-4.

| No. | District. | Locality. | No. of Gins. | | Licensee. |
|-----|-------------------|--------------------------|--------------|---------|-------------------------------------|
| | | | Saw. | Roller. | |
| 1 | Bagamoyo ... | Bagamoyo ... | 1 | 5 | Catholic Mission. |
| 2 | Dar es Salaam ... | Dar es Salaam ... | 1 | 7 | Rosehaugh & Co. |
| 3 | Kilwa ... | Kikanda ... | 1 | 7 | " " |
| 4 | Lindi ... | Lindi ... | — | 14 | Mathradas Nanji & Co. |
| 5 | " ... | " ... | — | 14 | Rosehaugh & Co. |
| 6 | Morogoro ... | Ngere-Ngere ... | 1 | 6 | " " |
| 7 | " ... | Kilosa ... | — | 12 | " " |
| 8 | " ... | Morogoro ... | 1 | 17 | " " |
| 9 | Moshi ... | Moshi ... | — | 2 | E. Hartmann. |
| 10 | Mwanza ... | Ihale Estate ... | — | 6 | G. H. Abdulrasul. |
| 11 | " ... | Ukerewe Island ... | 1 | 8 | White Fathers' Mission. |
| 12 | " ... | Mwanza ... | — | 14 | Nakasero Trading Co., Ltd. |
| 13 | " ... | Bukumbi Estate ... | 1 | 4 | Estate of late A. Visram. |
| 14 | " ... | Nyambiti ... | 2 | 6 | British Cotton Growing Association. |
| 15 | " ... | Nyanguge ... | 2 | 5 | " " |
| 16 | Rufiji ... | Kilimani, near Utete ... | — | 14 | Frantzis & Horn. |
| 17 | " ... | Betya, near Salale ... | — | 6 | Rosehaugh & Co. |
| 18 | Tanga ... | Ngomeni ... | 1 | — | A. Reder. |
| 19 | Usambara ... | Ndungu ... | — | 3 | Chabildas Mehta. |

ADDITIONAL GINNERIES EXPECTED TO BE IN OPERATION IN 1924.

| No. | District. | Locality. | Owner. |
|-----|-------------------|-------------------------|-----------------------------------|
| 1 | Morogoro ... | Rudewa (Kimamba) ... | Mathradas Nanji & Co. |
| 2 | " ... | Mikesse ... | Ramji Gulemani. |
| 3 | " ... | Mkatta ... | Jivanjee & Co. |
| 4 | Mwanza ... | Nassa ... | G. Boschetti. |
| 5 | " ... | Pambani ... | Kampala General Agency. |
| 6 | " ... | Runere ... | British East African Corporation. |
| 7 | " ... | Malampaka ... | " " " " |
| 8 | Tabora ... | Usagore (Shinyanga) ... | " " " " |
| 9 | Usambara ... | Mazinde ... | G. Jetha |
| 10 | Moshi ... | Himo ... | E. Hartmann. |
| 11 | Bukoba ... | Kyaka ... | British East African Corporation. |
| 12 | Tanga ... | Pangani Road ... | C. Galanos. |
| 13 | Dar es Salaam ... | Pugu ... | Abdulrasul & Sons. |
| 14 | Lindi ... | Mikindani ... | Mikindani Sisal Estates. |

APPENDIX IV.

TANGANYIKA TERRITORY—RAINFALL IN MILLIMETRES, 1923.

| DISTRICT. | METEOROLOGICAL STATION. | Alt. (Approximately.) | Lat. S. | Long. E. | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | TOTAL. |
|---------------|-------------------------|--------------------------|------------|-------------|-------|-------|-------|--------|-------|-------|-------|------|-------|-------|-------|-------|---------|
| ARUSHA | Arusha | feet. 4,416 | 3 23 | 36 43 | 19-0 | 117-0 | 101-6 | 512-7 | 319-1 | 21-1 | 11-5 | 34-0 | 22-5 | 7-0 | 14-0 | 43-0 | 1,222-5 |
| BAGAMOYO | Mbulu | 5,900 | 3 52 | 35 37 | 107-5 | 164-1 | 125-2 | 344-6 | 176-5 | 0-2 | 6-0 | 5-5 | 3-0 | 21-4 | 123-7 | 138-3 | 1,217-0 |
| BUKOKA | Bagamoyo | S.L. | 6 25 | 38 55 | 28-5 | 6-0 | 80-3 | 109-9 | 57-3 | 18-5 | 28-7 | 97-9 | nil | 33-1 | 28-3 | 109-1 | 597-6 |
| | Bukoba | 3,709 | 1 20 | 31 47 | 199-5 | 146-4 | 194-6 | 114-4 | 210-2 | 158-3 | 120-1 | 71-1 | 18-7 | 152-3 | 132-3 | 176-2 | 1,694-1 |
| DAR ES SALAAM | Biharamulo | 4,350 | 2 42 | 31 26 | 125-5 | 170-2 | 156-5 | 220-0 | 170-0 | nil | nil | nil | 27-2 | 34-5 | 38-0 | 154-7 | 1,096-6 |
| | Dar es Salaam | S.L. | 6 50 | 39 17 | 62-4 | 6-2 | 50-9 | 227-3 | 99-3 | 17-0 | 35-0 | 58-1 | 6-8 | 9-6 | 11-9 | 66-5 | 651-0 |
| | Msimbazi Mission | 42 | 6 50 | 39 17 | 36-9 | 3-7 | 36-3 | 27-5 | 58-5 | 3-0 | 34-3 | 45-0 | 26-6 | 11-8 | 21-6 | 16-3 | 321-5 |
| DODOMA | Dodoma | 3,693 | 6 11 | 35 46 | 50-5 | 156-1 | 45-4 | 203-7 | 2-4 | nil | nil | nil | nil | nil | 1-1 | 263-3 | 722-5 |
| | Manyoni | 4,300 | 5 43 | 34 51 | 141-9 | 113-8 | 97-0 | 297-8 | 8-7 | nil | nil | nil | nil | nil | 13-7 | 203-0 | 875-9 |
| | Singida | 5,233 | 4 48 | 34 45 | 57-1 | 182-1 | 70-2 | 207-0 | 9-2 | nil | nil | nil | nil | nil | 6-2 | 217-8 | 749-6 |
| IRINGA | Iringa | 5,365 | 7 47 | 35 37 | 103-8 | 157-4 | 80-7 | 126-2 | 5-2 | nil | 0-5 | nil | nil | nil | 1-7 | 180-1 | 655-6 |
| | Malangali | 4,775 | 8 35 | 30 00 | 174-0 | 177-3 | 137-5 | 67-8 | 3-5 | nil | nil | nil | 58-1 | 23-2 | 124-2 | 167-8 | 727-9 |
| KIGOMA | Kigoma | 2,531 | 4 52 | 29 38 | 103-5 | 113-5 | 67-4 | 137-7 | 31-1 | nil | nil | nil | 35-0 | 31-7 | 95-5 | 144-1 | 805-8 |
| | Ujiji | 2,738 | 4 59 | 29 47 | 113-8 | 90-9 | 130-1 | 136-4 | 39-8 | nil | nil | nil | 25-8 | 21-8 | 133-7 | 144-1 | 801-2 |
| | Kasulu | 4,530 | 4 35 | 30 07 | 136-5 | 102-3 | 157-7 | 276-0 | 125-0 | nil | nil | nil | 36-9 | 13-5 | 35-3 | 207-7 | 1,101-8 |
| KILWA | Kilwa | S.L. | 8 44 | 39 25 | 151-5 | 150-2 | 40-1 | 306-1 | 35-6 | nil | 4-4 | 54-7 | 36-9 | 13-5 | 35-3 | 207-7 | 1,036-0 |
| | Liwale | 1,500 | 9 45 | 38 00 | 79-2 | 273-8 | 159-0 | 171-1 | 38-0 | nil | 3-0 | nil | nil | 0-5 | 17-2 | 268-8 | 1,010-6 |
| KONDOA | Mkalama | 4,235 | 4 06 | 34 38 | 152-2 | 183-2 | 99-8 | 216-9 | 94-8 | nil | nil | nil | nil | nil | 74-3 | 280-7 | 1,101-9 |
| LINDI | Tunduru | 2,300 | 11 05 | 37 27 | 57-7 | 357-4 | 113-7 | 148-9 | 45-9 | 0-1 | nil | nil | nil | nil | nil | 195-2 | 923-0 |
| | Masasi Mission | 1,505 | 10 42 | 38 53 | 153-0 | 346-5 | 95-0 | 180-2 | 12-1 | nil | 1-7 | nil | nil | 0-7 | 54-6 | 225-5 | 1,069-3 |
| MAITA ISLAND | Kilindoni | 63 | 7 55 | 39 45 | 151-0 | 101-0 | 227-0 | 393-0 | 157-0 | 47-0 | 56-0 | 38-0 | 7-0 | 1-0 | 105-0 | 131-0 | 1,414-0 |

TANGANYIKA TERRITORY—RAINFALL IN MILLIMETRES, 1923—*continued*.

| DISTRICT. | METEOROLOGICAL STATION. | Alt. (Approximate) feet. | Lat. S. | Long. E. (Approximate). | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | TOTAL. |
|--------------|-------------------------|--------------------------------|------------|-------------------------------|-------|-------|-------|--------|-------|-------|-------|-------|-------|------|-------|-------|---------|
| MAHEGE ... | Mahenge ... | 3,352 | 8 40 | 36 43 | 453.4 | 287.2 | 208.7 | 645.7 | 17.6 | nil | 28.0 | 15.6 | 2.5 | 3.5 | 114.0 | 330.0 | 2,106.2 |
| MOROGORO ... | Kilosa ... | 1,606 | 6 48 | 37 01 | 111.0 | 144.1 | 112.4 | 229.6 | 65.9 | nil | 6.0 | 39.9 | nil | 7.0 | 26.2 | 199.4 | 941.5 |
| | Ngere-Ngere... | 641 | 6 47 | 38 08 | 70.2 | 64.3 | 65.7 | 286.2 | 87.0 | 23.0 | 7.5 | 39.5 | 39.5 | nil | 94.5 | 142.5 | 919.9 |
| MOSHI ... | Moshi ... | 2,649 | 3 22 | 37 22 | 5.4 | 106.1 | 158.9 | 361.4 | 4.1 | 3.6 | 1.2 | 1.2 | nil | nil | 0.4 | 1.4 | 643.7 |
| MWANZA ... | Mwanza ... | 3,709 | 3 32 | 32 53 | 24.1 | 146.8 | 72.1 | 450.9 | 110.0 | nil | 4.3 | nil | 47.2 | 55.2 | 96.8 | 154.0 | 1,161.4 |
| | Musoma ... | 3,709 | 1 28 | 33 47 | 6.6 | 190.7 | 36.9 | 195.0 | 181.4 | 9.5 | 2.3 | nil | 13.9 | 22.8 | 233.7 | 119.0 | 1,011.8 |
| PANGANI ... | Pangani ... | S.L. | 5 25 | 38 58 | 102.3 | nil | 24.0 | 193.2 | 45.1 | 64.2 | 72.3 | 119.5 | 12.5 | 47.5 | 33.7 | 1.5 | 715.8 |
| RUNGWE ... | Tukuyu ... | 5,069 | 9 15 | 33 38 | 182.0 | 177.5 | 71.4 | 921.1 | 339.1 | 23.7 | 45.3 | 52.9 | 86.0 | 60.2 | 24.2 | 343.8 | 2,330.2 |
| | Livingstonia Mission | 4,400 | 10 42 | 35 40 | 208.3 | 194.8 | 265.0 | 991.9 | 519.7 | 34.8 | 22.1 | 133.1 | 15.2 | 31.8 | 28.7 | 256.4 | 2,701.8 |
| SONGEA ... | Songea ... | 3,826 | 10 48 | 35 05 | 158.1 | 185.4 | 205.6 | 117.9 | 14.4 | nil | nil | nil | nil | 2.1 | 7.4 | 339.1 | 1,030.0 |
| | Lipumba ... | 3,270 | 10 04 | 34 39 | 212.9 | 243.6 | 118.4 | 84.9 | 33.7 | nil | nil | nil | nil | nil | 32.9 | 204.0 | 930.4 |
| | Milo ... | 8,300 | 10 04 | 32 33 | 164.6 | 107.0 | 228.3 | 713.9 | nil | 41.2 | nil | 30.9 | nil | nil | 108.8 | 392.7 | 1,787.4 |
| TABORA ... | Kahama ... | 4,055 | 3 35 | 32 33 | 103.8 | 144.2 | 101.4 | 261.7 | 50.9 | nil | nil | nil | 2.1 | 27.4 | 193.9 | 116.4 | 1,001.8 |
| | Kola'ndoto Mission | 4,400 | 3 34 | 33 19 | 67.8 | 141.9 | 103.2 | 200.4 | 96.5 | nil | nil | nil | 2.4 | 14.3 | 92.5 | 173.7 | 892.7 |
| TANGA ... | Tanga ... | S.L. | 5 40 | 39 07 | 79.0 | 1.6 | 89.4 | 274.3 | 102.6 | 77.8 | 108.5 | 143.0 | 53.2 | 28.5 | 63.2 | 92.7 | 1,113.8 |
| UFIPA ... | Namanyere ... | 5,100 | 8 00 | 32 00 | 116.3 | 118.0 | 164.5 | 171.8 | 105.5 | nil | 10.2 | nil | 38.2 | 16.1 | 147.3 | 100.4 | 988.3 |
| | Kasanga ... | 2,630 | 8 30 | 31 00 | 116.1 | 271.0 | 67.4 | 225.1 | nil | nil | nil | nil | 1.0 | 5.1 | 57.1 | 330.7 | 1,073.5 |
| USAMBARA ... | Lushoto ... | 4,579 | 4 47 | 38 17 | 85.6 | 97.8 | 100.3 | 421.9 | 172.6 | 32.9 | 69.9 | 52.1 | 11.5 | 14.5 | 129.2 | 144.2 | 1,332.5 |
| | Amani ... | 3,004 | 5 06 | 38 38 | 205.9 | 99.0 | 109.6 | 591.2 | 250.2 | 158.9 | 157.9 | 238.1 | 84.8 | 75.0 | 161.2 | 249.0 | 2,380.8 |
| | Sakare ... | 4,500 | 5 00 | 38 25 | 72.8 | 83.2 | 95.3 | 646.6 | 270.1 | 133.5 | 117.7 | 136.0 | 51.2 | 30.5 | 66.9 | 147.0 | 1,850.8 |

APPENDIX V.

BIOLOGICAL AND AGRICULTURAL INSTITUTE, AMANI.

ABSTRACT OF THE REPORT FOR THE FIFTEEN MONTHS
ENDING 31st MARCH, 1924.

ESTABLISHMENT AND GENERAL ORGANISATION.

1. Until December 1923, the establishment continued the same as in the previous year. The particulars are given on the first and second pages of this Report. Upon the decision being received of the indefinite postponement of the re-opening of the Institute for research, it became necessary to place the entire institution on a purely caretaking basis. In addition to the abolition of the post of Director, the following posts were abolished: laboratory assistant, native library clerk, native laboratory workers and artisans. Abolition of the Director's post will take effect on the termination of his leave in October 23rd, 1924. Since his departure, in December 1923, the working establishment has consisted of the Head Gardener, an assistant gardener and a native clerk. The Head Gardener was absent from the Institute from October 1922, to October 1923, on leave and on temporary transfer to the Botanic Gardens, Dar es Salaam.

2. The provision for labour for the financial year ending on the 31st March 1923, was the same as for the previous year—£900.

3. No research work was undertaken, and the small staff of laboratory assistants was employed in cleaning and disinfecting the botanical and entomological collections and caring for the laboratory equipment.

4. An inventory of the stores and equipment of the Institute has been taken.

5. Cinchona investigations.—The following extract is taken from a report by Professor Greenish and Dr. Corfield, of the Research Laboratories of the Pharmaceutical Society of Great Britain:—

It was with great interest that the Research Laboratories received from the Director of the Amani Research Institute samples of the bark of the three cinchona trees with a request to assay them and report to him. The trees from which these barks were derived were hybrids of *C. succirubra* and *C. Ledgeriana* and were marked No. I, No. II, and No. III.

No. I was in the form of handsome single or double quills, about 25 cm. long, 3 cm. in diameter, and 3 to 4 mm. thick. The outer surface showed strong longitudinal wrinkles (generally regarded as characteristic of *succirubra* bark), few and distant traverse cracks, and scattered, somewhat indistinct, warts. The cork showed little disposition to exfoliate. The colour of the transverse section and inner surface was reddish brown; the taste was very bitter, without much astringency.

No. III was very similar in appearance; the longitudinal wrinkles were in general less marked, but on one thin (1 mm.) piece they were conspicuous, this piece closely resembling *succirubra* branch bark.

No. II was also in handsome quills, but the bark showed distinct differences from both No. I and No. III. The quills were larger (up to 4.5 cm. in diameter) and the bark thicker (up to 6 mm.); the longitudinal wrinkles were more or less completely replaced by longitudinal cracks; there was more disposition for the cork to exfoliate; the colour was slightly more reddish and the taste more astringent.

The assay of these barks gave the following results:—

| | No. I. | No. II. | No. III. |
|---------------------------------------|-----------|-----------|-----------|
| | Per cent. | Per cent. | Per cent. |
| Moisture | 7.8 | 7.3 | 7.3 |
| Total alkaloid | 10.2 | 10.26 | 11.83 |
| Quinine | 6.97 | 5.45 | 6.77 |
| Cinchonidine | 0.62 | 2.70 | 0.73 |
| Quinidine | — | — | — |
| Yield of cryst. quinine sulph. | 9.48 | 7.41 | 9.20 |

The total alkaloid was determined by the method official in the Pharmacopœia of the United States, IX. For the determination of the quinine and cinchonidine, the process given in Thorpe's Dictionary of Chemistry, 2nd ed., p. 261, was followed. All three barks are therefore of good quality as quinine-yielding barks; Nos. I and III

are exceptionally good, and approach in their composition typical Ledger bark, but they contain about 50 per cent. more quinine than average commercial Ledger bark.

The richness of Nos. I and III in quinine, and the comparatively small amount of other alkaloids present, would amply justify the extension of the cultivation of these two trees, provided that the labour conditions were sufficiently favourable.

PLANT RECORDS.

6. The chief records of botanical interest were the flowering and fruiting respectively, for the first time at the Institute, of the Giant Bamboo (*Gigantochloa aspera*) and *Araucaria excelsa*; and the preparation of a list of seeds for distribution comprising 300 species (these are shown in Appendix II).

WORK IN THE PLANTATIONS AND NURSERY.

7. Seedlings of *Cinchona Ledgeriana* and of the hybrid *C. Ledgeriana* and *C. succirubra* to the number of 1,300 were raised for replacement in the plantation established in the previous year. The clove seedlings for replacement of the old trees are now ready for planting out. Other plants raised for replacement on the estate consisted of *Croton Tiglium*, *Durio zibethinus*, *Acacia farnesiana*, *Ilex paraguensis*.

8. The following are the principal records in respect of introduced planting material:—
(a) *Aleurites montana* (wood oil) and *A. Fordii* (tung oil) from Honk Kong:—The seeds failed to germinate.

(b) *Melinis minutiflora* (*Efwatakala grass*):—Both plots have grown well, but no flowering has yet taken place (15 months after planting).

(c) *Haronga madagascariensis*; *Prosopis juliflora*; *Mammea americana*:—Seedlings have been raised and planted out.

(d) *Coffea arabica* (Jamaica Blue Mountain):—Forty seedlings have been raised and a small plantation established.

(e) *Juniperus bermudiana*; *Blighia sapida*:—Seeds have failed to germinate.

9. The Head Gardener brought from the Royal Botanic Gardens, Kew, on his return from leave, planting material of a large number of ornamental varieties, for planting out in the grounds.

10. Maize.—Small plots of the two South African varieties, Hickory King and Natal 8-row, were planted in order to conserve the seed; 150 lbs. of the former and 44 lbs. of the latter were harvested.

PLANT DISTRIBUTION.

11. The plant distribution consisted of 630 packets of seeds, 8 sets of cuttings, 24 parcels of plants and 60 lb. of coffee seed. The details are included in the general list in Appendix I.

METEOROLOGICAL MATTERS.

12. The rainfall and average maximum and minimum temperatures are given as follows:—

| | Rainfall. | Temperature. | |
|--------------------|-----------|--------------|--------------|
| | | Average Max. | Average Min. |
| | mm. | C. | C. |
| January | 205·9 | 26·4 | 17·6 |
| February | 99·0 | 27·6 | 18·0 |
| March | 109·6 | 28·2 | 17·0 |
| April | 591·2 | 25·2 | 17·4 |
| May | 250·2 | 23·5 | 17·3 |
| June | 158·9 | 22·1 | 14·9 |
| July | 157·9 | 21·9 | 14·5 |
| August | 238·1 | 21·2 | 14·4 |
| September | 84·8 | 22·7 | 14·2 |
| October | 75·0 | 23·9 | 17·0 |
| November | 161·2 | 25·7 | 16·8 |
| December | 249·0 | 26·5 | 17·4 |
| TOTAL RAINFALL ... | 2,380·8 | | |

EXPENDITURE AND REVENUE.

13. Expenditure (excluding European salaries):—

| | Shs. |
|----------------------------------|------------------|
| Laboratory Assistant | 3,522.70 |
| Asiatic Clerk | 2,360.00 |
| Native Clerk | 2,250.00 |
| Artisans | 3,714.91 |
| Plants and seeds | 70.00 |
| Library | 46.80 |
| Upkeep of Station | 18,468.13 |
| Transport and Travelling | 920.50 |
| Railway Fares and Freight | 133.12 |
| Contingencies | 482.35 |
| Total | <u>31,968.51</u> |

14. Revenue:—

| | Shs. |
|--------------------------------------|-----------------|
| Coffee (prepared) | 533.78 |
| Coffee crop on trees | 750.00 |
| Tea (prepared) | 272.00 |
| Plants and seeds | 320.95 |
| Areca Nuts (Areca Catechu) | 74.50 |
| Tobacco | 9.38 |
| Pepper (prepared) | 9.00 |
| Coconut trees (rent) | 18.00 |
| Sales of Cattle | 434.52 |
| Rent for Government buildings | 179.00 |
| Sundry goods | 83.40 |
| Total | <u>2,684.53</u> |

MISCELLANEOUS MATTERS.

15. The number of treatments of out-patients at the Dispensary was 3,344.

16. The cattle herd was reduced in number by the sale of young bulls and old cows. The total at 31st March 1924, was 47.

17. The Head Gardener paid visits of inspection to the Government coffee and sisal plantations at Kihuhui and Kwamkorō.

18. The number of exhibits despatched from the Institute to the British Empire Exhibition was 49.

